



## The Influence of POLST on Treatment Intensity at the End of Life: A Systematic Review

Kelly C. Vranas, MD, MCR<sup>a,b,c,k</sup>, Wesley Plinke, MPH<sup>d</sup>, Donald Bourne, MPH<sup>e</sup>, Devan Kansagara, MD, MCR<sup>a,f</sup>, Robert Y. Lee, MD, MS<sup>h,i</sup>, Erin K. Kross, MD<sup>h,i</sup>, Christopher G. Slatore, MD, MS<sup>a,b,k</sup>, Donald R. Sullivan, MD, MA, MCR<sup>a,b,i</sup>

<sup>a</sup>Health Services Research & Development, VA Portland Health Care System; Portland, OR

<sup>b</sup>Division of Pulmonary and Critical Care, Oregon Health & Science University; Portland, OR

<sup>c</sup>Palliative and Advanced Illness Research (PAIR) Center, University of Pennsylvania; Philadelphia, PA

<sup>d</sup>Oregon Health & Science University School of Medicine

<sup>e</sup>University of Pittsburgh School of Medicine

<sup>f</sup>Division of General Internal Medicine, Oregon Health & Science University; Portland, OR

<sup>h</sup>Cambia Palliative Care Center of Excellence, University of Washington; Seattle, WA

<sup>i</sup>Division of Pulmonary, Critical Care, and Sleep Medicine, University of Washington; Seattle, WA

<sup>j</sup>Knight Cancer Institute, Oregon Health & Science University; Portland, OR

<sup>k</sup>Section of Pulmonary and Critical Care, VA Portland Health Care System; Portland, OR

### Abstract

**Background:** Despite its widespread implementation, it is unclear whether Physician Orders for Life-Sustaining Treatment (POLST) are safe and improve the delivery of care that patients desire. We sought to systematically review the influence of POLST on treatment intensity among patients with serious illness and/or frailty.

**Methods:** We performed a systematic review of POLST and similar programs using MEDLINE, EMBASE, CINAHL, Cochrane Central Register of Controlled Trials, Cochrane Database for

---

**Corresponding Author:** Kelly C. Vranas, MD, MCR, 3181 SW Sam Jackson Park Rd, Portland, OR 97239, vranas@ohsu.edu, @vranas\_kelly.

**Author Contributions:** KCV, WP, DB, DK, and DRS contributed to study concept and design; WP and DB performed literature search; KCV, WP, DB, and DRS contributed to analysis of data; all authors contributed to interpretation of data and manuscript preparation.

**Publisher's Disclaimer: Disclaimer:** The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. The Department of Veterans Affairs did not have a role in the conduct of the study; in the collection, management, analysis, or interpretation of data; or in the preparation of the manuscript. The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs or the U.S. Government.

**Reproducible Research Statement:** The study was prospectively registered in the International Prospective Register of Systematic Reviews (PROSPERO) (CRD42019139977), available at [www.crd.york.ac.uk/PROSPERO](http://www.crd.york.ac.uk/PROSPERO). *Statistical code:* not applicable. *Data Set:* available in the Supplement.

**Conflicts of Interest:** All authors declare that they do not have any conflicts of interest.

Systematic Reviews, and PsycINFO, from inception through February 28, 2020. We included adults with serious illness and/or frailty with life expectancy <1 year. Primary outcomes included place of death and receipt of high-intensity treatment (i.e., hospitalization in the last 30- and 90-days of life, ICU admission in the last 30-days of life, and number of care setting transitions in last week of life).

**Results:** Among 104,554 patients across 20 observational studies, 27,090 had POLST. No randomized controlled trials were identified. The mean age of POLST users was 78.7 years, 55.3% were female, and 93.0% were white. The majority of POLST users (55.3%) had orders for comfort measures only. Most studies showed that, compared to full treatment orders on POLST, treatment limitations were associated with decreased in-hospital death and receipt of high-intensity treatment, particularly in pre-hospital settings. However, in the acute care setting, a sizable number of patients likely received POLST-discordant care. The overall strength of evidence was moderate based on eight retrospective cohort studies of good quality that showed a consistent, similar direction of outcomes with moderate-to-large effect sizes.

**Conclusion:** We found moderate strength of evidence that treatment limitations on POLST may reduce treatment intensity among patients with serious illness. However, the evidence base is limited and demonstrates potential unintended consequences of POLST. We identify several important knowledge gaps that should be addressed to help maximize benefits and minimize risks of POLST.

### Keywords

POLST; Physician Orders for Life-Sustaining Treatment; end of life care; treatment intensity; systematic review

---

### Introduction

Near the end of life (EOL), patients often receive care that is inconsistent with their treatment preferences.<sup>1-4</sup> For example, among patients with advanced illness, the majority prefer to die at home,<sup>4-6</sup> yet approximately 20% die using intensive care unit (ICU) services in the hospital.<sup>3</sup> Medical treatment that is inconsistent with patients' and families' preferences is often considered low quality, burdensome care that potentially increases avoidable suffering for both patients and caregivers at the EOL<sup>7-9</sup> and significantly contributes to ballooning healthcare costs.<sup>10,11</sup> Furthermore, the importance of addressing advance care planning and providing care that is safe and consistent with patients' wishes has been heightened by the COVID pandemic, which has challenged healthcare systems worldwide and raised important issues regarding the potential need to ration healthcare in the context of scarce resources.<sup>12</sup>

The Physician Orders for Life-Sustaining Treatment (POLST) program was developed in the 1990s in Oregon to help increase goal-concordant care among patients with advanced illness or frailty who are approaching the EOL.<sup>13,14</sup> POLST forms allow patients to document their preferences for EOL care including code status and treatment intensity (i.e., comfort measures only, limited medical interventions, or full treatment).<sup>15</sup> However, POLST goes

farther than advance directives in instantiating these treatment preferences into portable, actionable medical orders designed to be implemented across healthcare settings.<sup>14,16,17</sup>

In 2004, the National POLST Advisory Panel was created to establish quality standards for POLST forms and assist states in developing their own similar programs.<sup>18</sup> Subsequently, the POLST paradigm was operationalized in some form across all 50 states in the U.S. using similarly named programs (e.g., Medical Orders for Life-Sustaining Treatment (MOLST), herein referred to as “POLST”),<sup>15,19,20</sup> with several other countries worldwide implementing comparable programs as well.<sup>21,22</sup>

Despite its widespread implementation, several questions remain unanswered regarding the use and safety of POLST.<sup>23</sup> For example, several surveys of physicians and emergency medical services providers raise concerns about the interpretability of POLST and whether they accurately reflect patients’ preferences.<sup>24–27</sup> Two prior systematic reviews of POLST have been published, with one describing its use in clinical settings<sup>28</sup> and the other evaluating the concordance between documented treatment preferences on POLST with actual care delivered.<sup>29</sup> However, neither study assessed the quality or strength of available evidence or the breadth of studies. Given concerns that the existing evidence does not support widespread implementation of POLST,<sup>23</sup> we conducted a systematic review of the literature to address this knowledge gap. We sought to 1) evaluate whether designated treatment limitations on POLST are associated with less intensive medical care compared to no treatment limitations, and 2) identify areas for future research in the context of the existing evidence base and high prevalence of POLST.

## Methods

### Overview

We performed a systematic review of studies published through February 2020 that evaluated the use of POLST and whether POLST influences treatment intensity among U.S. adults with serious illness. The Institutional Review Board of the Portland VA Health Care System deemed this research exempt from review. We registered this study prospectively with PROSPERO, the international register of systematic reviews, on 5/9/2019 (Registration ID No. CRD42019139977).<sup>30</sup> We followed the PRISMA guidelines for article review and data extraction.<sup>31</sup>

### Data Sources and Searches

To identify relevant articles, we searched MEDLINE, EMBASE, CINAHL, Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Database for Systematic Reviews (CDSR), and PsycINFO, using key words for all known variations of Physician Order for Life-Sustaining Treatment (e.g., Medical, state’s name) and their acronyms (e.g., POLST, MOLST), from database inception through February 28, 2020. We obtained additional articles from references lists of included studies, experts, and POLST organization webpages. Searches were developed in consultation with a research librarian (Supplemental Table S1).

## Study Selection

We limited study inclusion to published articles (including observational studies) in peer-reviewed journals written in English. Studies published as conference abstracts, reviews, case reports or unpublished trials were excluded. Study selection was based on predefined eligibility criteria, including patients with a POLST with serious illness and/or frailty with life expectancy <1 year. Outcomes included treatment intensity at the EOL (i.e., hospitalization in the last 30 and 90 days of life, ICU admission in the last 30 days of life, and care setting transitions in the last week of life) and place of death.<sup>1,32–35</sup>

Titles and abstracts of articles were screened independently by two reviewers. Articles selected as potentially relevant by either reviewer were pulled for full-text review and sequentially assessed by two reviewers.

## Data Extraction and Quality Assessment

We used a standardized, pre-piloted form to extract data from all eligible articles for study characteristics and each included outcome. All data were extracted independently and in duplicate by trained abstractors. Study quality was assessed independently by two reviewers using the Newcastle-Ottawa Quality Assessment Scale<sup>36</sup> and rated as having a low-, medium-, or high-risk of bias. All disagreements were resolved by consensus with a third reviewer.

## Data Synthesis

We graded the strength of the evidence using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach based on the Agency for Healthcare Research and Quality (AHRQ) Methods Guide for Comparative Effectiveness Reviews.<sup>37,38</sup> Strength of evidence ratings ranged from high, moderate, low, or insufficient based on consideration of several factors, including consistency of results across studies, quality of studies, precision and effect sizes of estimates, and the potential effects of confounding on results. Strength of the evidence was graded independently by two reviewers and disagreements were resolved by consensus with a third reviewer.

Given the substantial design heterogeneity across included studies (Supplemental Table S2), we did not perform a meta-analysis, as this may lead to imprecise and possibly invalid inferences.<sup>39</sup> Instead, we synthesized the results qualitatively. To aid with interpretability, we also calculated the unadjusted weighted average for two primary outcomes of ICU admission and location of death among studies deemed to be “good quality” per the Newcastle-Ottawa Quality Assessment Scale for Cohort Studies.<sup>36</sup> Specifically, we calculated the percentage of patients with the outcome of interest for each exposure group (i.e., full treatment orders on POLST compared to orders for limited treatment or comfort measures only on POLST).

## Results

Our initial searches of relevant databases yielded 1,924 unique, potentially relevant articles. Abstract screening resulted in 186 articles, which we reviewed in full. After applying exclusion criteria, we included 20 studies in analyses (Supplemental Figure S1).

### Description of Studies

The 20 articles describe data collected in the period 1998–2020 (Tables 1 and 2). At total of 104,554 patients with and without POLST were included across all studies, with a median sample size of 387 patients (interquartile range [IQR] 317, 1738). Among the 27,092 patients with POLST across all studies, the median sample size was 261 (IQR 145, 830). All studies were observational and included four descriptive studies<sup>40–43</sup>, 15 retrospective cohort studies,<sup>14,17,32–35,44–52</sup> and one prospective cohort study.<sup>53</sup> There were no randomized controlled trials of POLST. Nine studies were conducted solely among decedents,<sup>32–35,41,42,48–50</sup> Six studies included patients at nursing facilities or enrolled in hospice,<sup>17,40,43,47,50,52</sup> whereas seven studies occurred in acute care settings (i.e., prehospital emergency medical services, emergency department, hospital, or ICU).<sup>14,44–46,48,51,53</sup> Twelve of the 20 included articles were conducted fully or partly in Oregon (Table 1).<sup>14,17,32,33,35,42–44,46,50–52</sup>

### Characteristics of Study Participants

Among study participants with POLST (N=27,090), mean age was 78.7 years old, 55.3% were female, and 93% were white. Approximately 84% of study participants resided in Oregon (Table 3). Cancer was the most common co-morbidity (37.4%), followed by pulmonary disease (34.5%), cardiac disease (33.5%), and dementia and/or neurodegenerative disease (30.4%). The majority of patients (55.3%) had POLST orders for comfort-measures only, compared to 30.4% with limited treatment orders and 13.8% with full treatment orders.

### Influence of POLST on Outcomes

There was consistent evidence across eight good quality<sup>14,32,34,35,44,48,51,52</sup> and four poor quality observational studies<sup>33,46,49,50</sup> that treatment limitations on POLST are associated with less in-hospital death and high-intensity treatment. For example, in a 2014 study of 58,000 decedents over a one-year period in Oregon, patients with limited or full treatment orders on POLST had higher odds of dying in the hospital compared to those with orders for comfort measures only (adjusted odds ratio [aOR] of 3.97, 95% confidence interval [CI] 3.59–4.39; aOR 9.66, 95% CI 8.29–11.1, respectively).<sup>32</sup> Among Veterans with advanced-stage lung cancer, POLST was associated with higher odds of hospice enrollment (aOR 2.37, 95% CI 1.01–5.54) and lower odds of dying in a VA acute care setting (aOR 0.27, 95% CI 0.12–0.59) compared to patients without POLST.

In a 2014 study of 1,557 patients in Oregon who suffered out-of-hospital cardiac arrest, of whom 82 had a previously signed POLST form, 47 out of 50 patients (94%) with a do-not-resuscitate POLST order had resuscitation withheld or ceased before hospital admission (95% CI, 83–99%). Similarly, a 2010 retrospective cohort study of 1,711 randomly sampled

nursing facility residents in Oregon, Wisconsin, and West Virginia found that residents with POLST comfort measures only orders were 42% less likely to receive life-sustaining medical interventions than residents with POLST limited treatment orders ( $p=0.03$ ), and 67% less likely to receive life-sustaining medical interventions than residents with full treatment orders ( $p=0.004$ ).<sup>52</sup>

We also found consistent evidence across five good quality<sup>14,34,48,51,53</sup> and three poor quality<sup>45,46,49</sup> observational studies that treatment limitations on POLST are associated with reduced incidence of hospitalization and ICU admission among patients in the acute care setting.<sup>14,48</sup> For example, a recent study evaluated the association between POLST order (i.e., comfort measures only, limited interventions, or full treatment) and ICU admission among 1,818 decedents who were hospitalized within 6 months of their death. Treatment limitations on POLST were associated with significantly lower rates of ICU admission compared with full-treatment POLST orders (comfort measure only: adjusted relative risk (aRR) 0.53 [95% CI, 0.45–0.62]; limited interventions: aRR 0.79, 95% CI 0.71–0.87). However, 38% of patients with treatment limitations on POLST received care that was discordant with their documented preferences.<sup>48</sup> Additionally, in a 2019 study of patients presenting to the emergency department with POLST, treatment limitations on POLST (including orders for comfort measures only) were associated with reduced odds of ICU admission compared to POLST with full treatment orders (aOR 0.31, 95% CI 0.16–0.61).

### **POLST Accessibility**

Several studies highlight the importance of accessibility of POLST. For example, a study of patients presenting to the emergency department at a single academic medical center found that POLST forms were accessed less than 7% of the time by emergency clinicians.<sup>14</sup> In a study of older persons who suffered trauma and presented to a level 1 trauma center, authors found that the explicit acknowledgement of treatment limitations on POLST within 24 hours by the primary team was associated with fewer ICU days compared with similarly injured older persons (1.7 vs 2.8 days,  $p=0.008$ ).<sup>51</sup>

POLST may also facilitate communication of treatment limitations for non-communicative patients. In a 2019 prospective cohort study of 1,507 patients recently discharged from the hospital with do-not-resuscitate/do-not-intubate orders on MOLST forms, 124 patients (8%) had unplanned readmissions. Among these readmissions, 112 patients (90%) could communicate or were accompanied by a proxy at readmission, and 12 (10%) could not communicate and were unaccompanied. For patients who were unaccompanied and could not communicate, MOLST significantly decreased the median time from readmission to do-not-resuscitate/do-not-intubate order (1.2 vs 27.1 hours,  $p=0.001$ ), but this association was greatly attenuated among patients who could communicate or were accompanied by a proxy (16.4 vs 25.4 hours,  $p=0.10$ ).<sup>53</sup>

### **Quality Assessment**

To our knowledge, randomized controlled trials evaluating the impact of POLST on patient outcomes do not exist. All but one of the studies included in this review<sup>53</sup> were purely descriptive or used a historically-controlled design among relatively homogenous



populations concentrated in the Pacific Northwest of the U.S., which leads to an inherently high risk of bias. Differences in local culture, provider practice patterns, and patient care preferences also contribute to important differences in EOL care and represent unmeasured confounders in these observational designs. Additionally, recent studies suggest that treatment limitations on POLST may be potentially inaccurate, undisclosed, and even discordant with patients' stated wishes,<sup>26,54</sup> making it difficult to know whether POLST orders truly reflect informed decision-making between patients, their healthcare proxies, and clinicians.<sup>55</sup>

With those limitations in mind, we used the Newcastle-Ottawa Quality Assessment Scale for Cohort studies<sup>36</sup> to identify ten of the 20 included studies (50%) as good quality based on representation of selected cohorts, comparability of cohorts based on study design and analysis, and outcomes measured. The remaining 10 were deemed poor quality (50%), primarily due to a lack of comparability of cohorts on the basis of the design or analysis (Figure 1).

### Strength of Evidence

In systematic reviews, strength of evidence for observational studies is initially assigned a provisional grade of low strength of evidence. However, this grade may be raised to moderate for an observational study body of evidence when the study limitation domain is scored as low or medium, or when plausible confounding would work in the opposite direction of the observed effect.<sup>31</sup> In the case of POLST, observational study designs do not account for important differences between patients who complete a POLST and those who do not. For example, patients with more advanced illness may be more likely to need hospitalization and ICU care in the absence of the intervention (e.g., treatment limitations on POLST). One might expect such unmeasured confounding to tend towards bias away from the null hypothesis.

Furthermore, additional observational studies of POLST are unlikely to significantly alter current findings given the consistent direction and strengths of association in the available studies. For these reasons, the overall strength of the evidence was determined to be moderate based on eight retrospective cohort studies of good quality that showed a consistent, similar direction of outcomes with moderate-to-large treatment effects for the outcomes of in-hospital death and receipt of high-intensity treatment at the EOL (i.e., CPR, hospitalization, and ICU admission).<sup>38</sup>

### Summary Analyses

Of the eight "good quality" studies, we identified two studies evaluating the outcome of ICU admission and two evaluating location of death among patients with POLST.<sup>14,48</sup> Among these studies, we calculated that an unadjusted weighted average of 24.1% of patients with orders for limited treatment and/or comfort measures only were admitted to the ICU, compared to 28.0% of patients with full treatment orders on POLST. Similarly, we calculated that an unadjusted weighted average of 11.1% patients with orders for limited treatment or comfort measures only died in the hospital, compared to 44.0% of patients with full treatment orders on POLST.

## Discussion

In this systematic review, we found moderate strength of evidence that treatment limitations on POLST (i.e., comfort measures only or limited medical interventions) may reduce treatment intensity among patients near or at the EOL, particularly in prehospital settings, compared to no treatment limitations on POLST (i.e., full treatment). This conclusion was based on 20 observational studies (N=27,090) that had similar direction of outcomes and moderate-to-large effect sizes, with plausible confounding that works in the direction opposite of the observed effect.<sup>37</sup> POLST users were mostly older, white, and from the Pacific Northwest region; their most common comorbidities were cancer, cardiac, or pulmonary disease, and they most often preferred comfort measures only. Importantly, the lack of comparator groups and non-probabilistic sampling methods used across studies are important limitations to consider when designing future studies to understand when, how, and whether POLST should be utilized as part of efforts to ensure the delivery of care that patients actually desire.

Patients with advanced illness often receive potentially unwanted care at the EOL, including high-intensity treatment in the ICU.<sup>47</sup> These trends are concerning, since patients at the EOL often prefer treatment focused on palliation.<sup>56</sup> For these patients, receipt of high-intensity treatment may threaten patient safety and represent unmeasured medical errors and/or adverse events. Additionally, such high-intensity treatment is not associated with better quality care or outcomes such as survival or perceptions of care quality among bereaved family members.<sup>49–51</sup>

Traditionally, completion of advance care planning documents such as advance directives and living wills, and the designation of a surrogate decision maker in the form of durable power of attorney, may help reduce the risk of goal-discordant care. However, these legal documents may be difficult to access during medical emergencies that occur at unpredictable times, and are often underutilized (particularly in younger patients),<sup>7,57,58</sup> in part due to their hypothetical nature and inability to capture all possible medical scenarios a person may experience.<sup>52,53</sup> Furthermore, these documents usually have state-specific legal requirements such as notarization or witnesses to validate documented preferences,<sup>59</sup> creating additional barriers to completion.

The intention of the POLST paradigm is to ameliorate some of these shortcomings by providing standardized directives that prehospital clinicians (e.g., emergency medical technicians, paramedics) can use as guidance in these settings. POLST forms also stipulate patients' preferences for specific medical interventions (e.g., CPR, mechanical ventilation) as part of clinicians' orders that are portable across healthcare settings.<sup>15</sup> In addition, some states have created registries that enable treating clinicians to access patients' preferences electronically or via telephone in real-time when they are urgently needed.<sup>13</sup> These potential benefits of POLST may help explain the rapid expansion of POLST nationally over recent years.

Although findings from this systematic review suggest that treatment limitations on POLST reduce treatment intensity among patients with serious illness, the existing evidence base is



limited and demonstrates that not all of the potential benefits of the POLST paradigm have been realized. For example, one study found that nearly two in five patients with treatment limitations on POLST received high-intensity treatment that was discordant with their POLST.<sup>48</sup> Several factors may contribute to these findings, including infrequent accession of POLST in the acute care setting,<sup>14</sup> inaccurate and/or inconsistent interpretation of POLST orders,<sup>24,25</sup> POLST orders that do not accurately reflect patients' wishes at the time and in the context in which the POLST order is used,<sup>23,48</sup> and the impact of clinical momentum in the acute care setting.<sup>60</sup>

Nonetheless, the POLST paradigm highlights several important considerations applicable for improving advance care planning more broadly. First, perhaps the greatest benefit of POLST lies upstream of the acute care setting in pre-hospital settings or nursing homes, helping to disrupt the clinical momentum that is often initiated during medical emergencies and which may contribute to the provision of unwanted care in the hospital.<sup>32,35,60</sup> Second, accessibility of advance care planning documents is important in efforts to deliver goal-concordant care, particularly for patients who are unable to speak for themselves.<sup>53</sup>

Third, using POLST form completion as a quality metric and surrogate for high-quality communication may have unintended consequences. For instance, POLST forms are often used as a substitute for code status documentation among patients admitted to skilled nursing facilities or before elective surgeries.<sup>62</sup> The use of POLST in this way bypasses important conversations regarding treatment preferences between patients and their clinicians that are necessary for the provision of high-quality, goal-concordant care. It also raises concerns about the voluntariness of completion by forcing patients to make premature decisions in hypothetical scenarios rather than known circumstances.<sup>23,59,61</sup> Additionally, the use of POLST form completion as a quality metric may explain the higher than expected proportion of POLST users without care limitations,<sup>14</sup> contribute to incorrectly completed forms,<sup>26,62</sup> and threaten patient-centered decision making and safety.<sup>23</sup> Instead, POLST should serve as a tool that prompts high-quality communication between clinicians, patients, and their healthcare proxies to ensure patients' goals of care are honored at the EOL.

Importantly, given the prevalence and scope of POLST programs across the U.S., future attempts to study the efficacy of POLST in randomized trials are likely infeasible. However, the use of quasi-experimental methods such as pragmatic effectiveness or hybrid effectiveness/implementation trials of POLST may be particularly helpful to address several existing knowledge gaps regarding when, how, and in whom POLST might be most effective (Table 4). Further research is also necessary to minimize potential unintended consequences of POLST, reduce existing healthcare disparities in receipt of high-quality EOL care, and help ensure that treatment preferences on POLST reflect informed decision-making processes between patients, their surrogates, and clinicians.

Our systematic review has several limitations. First, we only included studies in English. Second, it is possible that our expert-informed systematic search strategy missed studies reporting relevant data. Third, the uptake of POLST across different regions varies considerably. Furthermore, the quality of data reporting for participants characteristics and outcomes across the studies was variable and limited to particular geographic regions where

POLST is more common (e.g., the Pacific Northwest), thereby limiting our ability to draw conclusions about the use of POLST and similar programs more broadly. Fourth, this review did not evaluate the process of POLST completion or address concordance between POLST orders and treatment received.

## Conclusion

In this systematic review of observational studies only, we found moderate strength of evidence that treatment limitations on POLST may reduce treatment intensity among seriously ill patients, particularly in prehospital settings. However, the existing evidence base is limited and demonstrates the potential for unintended consequences of POLST that may threaten patient safety. We identify several important considerations for future research to help maximize potential benefits and minimize potential risks of POLST, including in whom, when, how, how often, and whether POLST should be completed. Further research addressing these questions is important to promote patient-centered decision making and high-quality, goal-concordant care.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgements

The study team would like to thank research librarian Robin Paynter for her assistance with the search methodology, and Beth Hooker and Apoorva Salvi for their help with statistical analysis.

### Sponsor's Role:

Funding was provided by the U.S. Department of Veterans Affairs, Veterans Health Administration, Office of Research and Development, Sojourns Scholar Leadership Program Award of the Cambia Health Foundation the National Heart, Lung and Blood Institute from of the National Institute of Health (grant 5K12HL133115 [Dr. Vranas]), and the National Cancer Institute of the National Institutes of Health (grant K07CA190706 [Dr Sullivan]).

## References

1. Teno JM, Fisher ES, Hamel MB, Coppola K, Dawson NV. Medical care inconsistent with patients' treatment goals: association with 1-year Medicare resource use and survival. *J Am Geriatr Soc* 2002;50:496–500. [PubMed: 11943046]
2. Angus DC, Truog RD. Toward Better ICU Use at the End of Life. *JAMA* 2016;315:255–256. [PubMed: 26784767]
3. Angus DC, Barnato AE, Linde-Zwirble WT, et al. Use of intensive care at the end of life in the United States: an epidemiologic study. *Crit Care Med* 2004;32:638–643. [PubMed: 15090940]
4. Approaching Death: Improving Care at the End of Life. A report from the Institute of Medicine. *Health Serv Res* 1998;33:1–3. [PubMed: 9566173]
5. Higginson IJ, Sen-Gupta GJ. Place of care in advanced cancer: a qualitative systematic literature review of patient preferences. *J Palliat Med* 2000;3:287–300. [PubMed: 15859670]
6. Foreman J. 70% would pick hospice. *Boston Globe*. 10 4, 1996.
7. Yadav KN, Gabler NB, Cooney E, et al. Approximately One In Three US Adults Completes Any Type Of Advance Directive For End-Of-Life Care. *Health Aff (Millwood)* 2017;36:1244–1251. [PubMed: 28679811]
8. Hogan C, Lunney J, Gabel J, Lynn J. Medicare beneficiaries' costs of care in the last year of life. *Health Aff (Millwood)* 2001;20:188–195.

9. Smith AK, McCarthy E, Weber E, et al. Half of older Americans seen in emergency department in last month of life; most admitted to hospital, and many die there. *Health Aff (Millwood)* 2012;31:1277–1285. [PubMed: 22665840]
10. Bekelman JE, Halpern SD, Blankart CR, et al. Comparison of Site of Death, Health Care Utilization, and Hospital Expenditures for Patients Dying With Cancer in 7 Developed Countries. *JAMA* 2016;315:272–283. [PubMed: 26784775]
11. Shrank WH, Rogstad TL, Parekh N. Waste in the US Health Care System: Estimated Costs and Potential for Savings. *JAMA* 2019;322:1501–1509. [PubMed: 31589283]
12. Curtis JR, Kross EK, Stapleton RD. The Importance of Addressing Advance Care Planning and Decisions About Do-Not-Resuscitate Orders During Novel Coronavirus 2019 (COVID-19). *JAMA* 2020;323:1771–1772. [PubMed: 32219360]
13. Oregon Portable Orders for Life-Sustaining Treatment Program. Available at: <http://www.oregonpolst.org>. Accessed November 13, 2020.
14. Vranas KC, Lin AL, Zive D, et al. The Association of Physician Orders for Life-Sustaining Treatment With Intensity of Treatment Among Patients Presenting to the Emergency Department. *Ann Emerg Med* 2020 2;75:171–180. [PubMed: 31248675]
15. National POLST Participating Programs. <https://polst.org/programs-in-your-state/#levels>. Accessed April 27, 2021.
16. Tolle SW, Teno JM. Lessons from Oregon in Embracing Complexity in End-of-Life Care. *N Engl J Med* 2017;376:1078–1082. [PubMed: 28296604]
17. Hickman SE, Nelson CA, Moss AH, Tolle SW, Perrin NA, Hammes BJ. The consistency between treatments provided to nursing facility residents and orders on the physician orders for life-sustaining treatment form. *J Am Geriatr Soc* 2011;59:2091–2099. [PubMed: 22092007]
18. National POLST Paradigm Program Designations. <https://polst.org/programs-in-your-state/#levels>. Accessed February 24, 2020.
19. Hickman SE, Critser R. National Standards and State Variation in Physician Orders for Life-Sustaining Treatment Forms. *J Palliat Med* 2018;21:978–986. [PubMed: 29624461]
20. Abbott J The POLST Paradox: Opportunities and Challenges in Honoring Patient End-of-Life Wishes in the Emergency Department. *Ann Emerg Med* 2019;73(3):294–301. [PubMed: 30503382]
21. Mayoral VFS, Fukushima FB, Rodrigues AM, et al. Cross-Cultural Adaptation of the Physician Orders for Life-Sustaining Treatment Form to Brazil. *J Palliat Med*. 2018;21:815–819. [PubMed: 29431571]
22. Lovadini GB, Fukushima FB, Schoueri JFL, et al. Evaluation of the Interrater Reliability of End-of-Life Medical Orders in the Physician Orders for Life-Sustaining Treatment Form. *JAMA Netw Open* 2019;2:e192036. [PubMed: 30977852]
23. Moore KA, Rubin EB, Halpern SD. The Problems With Physician Orders for Life-Sustaining Treatment. *JAMA* 2016;315:259–260. [PubMed: 26784769]
24. Mirarchi FL, Doshi AA, Zerkle SW, Cooney TE. TRIAD VI: how well do emergency physicians understand Physicians Orders for Life Sustaining Treatment (POLST) forms? *Journal of patient safety*. 2015;11(1):1–8. [PubMed: 25692502]
25. Mirarchi FL, Cammarata C, Zerkle SW, Cooney TE, Chenault J, Basnak D. TRIAD VII: do prehospital providers understand Physician Orders for Life-Sustaining Treatment documents? *J Patient Saf* 2015;11(1):9–17. [PubMed: 25692503]
26. Mirarchi FL, Juhasz K, Cooney TE, et al. TRIAD XII: Are Patients Aware of and Agree With DNR or POLST Orders in Their Medical Records. *J Patient Saf* 2019;15(3):230–237. [PubMed: 31449196]
27. Mirarchi FL, Cooney TE, Venkat A, et al. TRIAD VIII: Nationwide Multicenter Evaluation to Determine Whether Patient Video Testimonials Can Safely Help Ensure Appropriate Critical Versus End-of-Life Care. *J Patient Saf* 2017;13(2):51–61. [PubMed: 28198722]
28. Hickman SE, Keevern E, Hammes BJ. Use of the physician orders for life-sustaining treatment program in the clinical setting: a systematic review of the literature. *J Am Geriatr Soc* 2015;63:341–350. [PubMed: 25644280]

29. Tark A, Song J, Parajuli J, Chae S, Stone PW. Are We Getting What We Really Want? A Systematic Review of Concordance Between Physician Orders for Life-Sustaining Treatment (POLST) Documentation and Subsequent Care Delivered at End-of-Life. *Am J Hosp Palliat Care* 2021;38(9):1142–1158. [PubMed: 33251826]
30. PROSPERO: international prospective register of systematic reviews [home page on the Internet]. York (UK): University of York Centre for Reviews and Dissemination. Available at: <http://www.crd.york.ac.uk/prospéro>. Accessed May 19, 2019.
31. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. 2009;6(7):e1000097. [PubMed: 19621072]
32. Fromme EK, Zive D, Schmidt TA, Cook JN, Tolle SW. Association between Physician Orders for Life-Sustaining Treatment for Scope of Treatment and in-hospital death in Oregon. *J Am Geriatr Soc* 2014;62:1246–1251. [PubMed: 24913043]
33. Tuck KK, Zive DM, Schmidt TA, Carter J, Nutt J, Fromme EK. Life-sustaining treatment orders, location of death and co-morbid conditions in decedents with Parkinson’s disease. *Parkinsonism Relat Disord* 2015;21:1205–1209. [PubMed: 26342561]
34. Hammes BJ, Rooney BL, Gundrum JD, Hickman SE, Hager N. The POLST program: a retrospective review of the demographics of use and outcomes in one community where advance directives are prevalent. *J Palliat Med* 2012;15:77–85. [PubMed: 22233467]
35. Nugent SM, Slatore CG, Ganzini L, et al. POLST Registration and Associated Outcomes Among Veterans With Advanced-Stage Lung Cancer. *Am J Hosp Palliat Care* 2019;36:564–570. [PubMed: 30700127]
36. Wells GA, Shea B, O’Connell D, Peterson J, Welch V, Losos M, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses (online). Available at: [http://www.ohri.ca/programs/clinical\\_epidemiology/oxford.asp](http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp). Accessed July 20, 2020.
37. Berkman ND, Lohr KN, Ansari M, et al. Grading the Strength of a Body of Evidence When Assessing Health Care Interventions: an EPC update. *J Clin Epidemiol* 2015;68:1312–1324. [PubMed: 25721570]
38. Owens DK, Lohr KN, Atkins D, et al. AHRQ series paper 5: grading the strength of a body of evidence when comparing medical interventions--agency for healthcare research and quality and the effective health-care program. *J Clin Epidemiol* 2010;63:513–523. [PubMed: 19595577]
39. Althuis MD, Weed DL, Frankenfeld CL. Evidence-based mapping of design heterogeneity prior to meta-analysis: a systematic review and evidence synthesis. *Syst Rev* 2014;3(1):80. [PubMed: 25055879]
40. Araw AC, Araw AM, Pekmezaris R, et al. Medical orders for life-sustaining treatment: is it time yet? *Palliat Support Care* 2014;12:101–105. [PubMed: 23663533]
41. Hopping-Winn J, Mullin J, March L, Caughey M, Stern M, Jarvie J. The Progression of End-of-Life Wishes and Concordance with End-of-Life Care. *J Palliat Med* 2018;21:541–545. [PubMed: 29298109]
42. Lee MA, Brummel-Smith K, Meyer J, Drew N, London MR. Physician orders for life-sustaining treatment (POLST): outcomes in a PACE program. *Program of All-Inclusive Care for the Elderly. J Am Geriatr Soc* 2000;48:1219–1225. [PubMed: 11037008]
43. Tolle SW, Tilden VP, Nelson CA, Dunn PM. A prospective study of the efficacy of the physician order form for life-sustaining treatment. *J Am Geriatr Soc* 1998;46:1097–1102. [PubMed: 9736102]
44. Zive D, Newgard CD, Lin A, Caughey AB, Malveau S, Eckstrom E. Injured Older Adults Transported by Emergency Medical Services: One Year Outcomes by POLST Status. *Prehosp Emerg Care* 2020;24:257–264. [PubMed: 31058558]
45. Serrano-Eanelli D, Fattakhov E, Krishna M, et al. Electronic medical orders for life-sustaining treatment in New York State: Length of stay, direct costs in an ICU setting. *Palliat Support Care* 2019;17:584–589. [PubMed: 30636653]
46. Richardson DK, Fromme E, Zive D, Fu R, Newgard CD. Concordance of out-of-hospital and emergency department cardiac arrest resuscitation with documented end-of-life choices in Oregon. *Ann Emerg Med* 2014;63:375–383. [PubMed: 24210466]

47. Lum H, Obafemi O, Dukes J, Nowels M, Samon K, Boxer RS. Use of Medical Orders for Scope of Treatment for Heart Failure Patients During Postacute Care in Skilled Nursing Facilities. *J Am Med Dir Assoc* 2017;18:885–890. [PubMed: 28688730]
48. Lee RY, Brumback LC, Sathitratanacheewin S, et al. Association of Physician Orders for Life-Sustaining Treatment With ICU Admission Among Patients Hospitalized Near the End of Life. *JAMA* 2020;323:950–960. [PubMed: 32062674]
49. Jennings LA, Turner M, Keebler C, et al. The Effect of a Comprehensive Dementia Care Management Program on End-of-Life Care. *J Am Geriatr Soc* 2019;67:443–448. [PubMed: 30675898]
50. Hickman SE, Nelson CA, Moss AH, et al. Use of the Physician Orders for Life-Sustaining Treatment (POLST) paradigm program in the hospice setting. *J Palliat Med* 2009;12:133–141. [PubMed: 19207056]
51. Ballou JH, Dewey EN, Zonies DH. Elderly patients presenting to a Level I trauma center with Physician Orders for a Life-Sustaining Treatment form: A propensity-matched analysis. *J Trauma Acute Care Surg* 2019;87:153–160. [PubMed: 31033897]
52. Hickman SE, Nelson CA, Perrin NA, Moss AH, Hammes BJ, Tolle SW. A comparison of methods to communicate treatment preferences in nursing facilities: traditional practices versus the physician orders for life-sustaining treatment program. *J Am Geriatr Soc* 2010;58:1241–1248. [PubMed: 20649687]
53. Turnbull AE, Ning X, Rao A, Tao JJ, Needham DM. Demonstrating the impact of POLST forms on hospital care requires information not contained in state registries. *PLoS One* 2019;14:e0217113–e0217113. [PubMed: 31211788]
54. Hickman SE, Torke AM, Sachs GA, et al. Factors associated with concordance between POLST orders and current treatment preferences. *J Am Geriatr Soc* 2021;69(7):1865–1876. [PubMed: 33760241]
55. Hickman SE, Torke AM, Heim Smith N, et al. Reasons for discordance and concordance between POLST orders and current treatment preferences. *J Am Geriatr Soc* 2021;69(7):1933–1940. [PubMed: 33760226]
56. Barnato AE, Herndon MB, Anthony DL, et al. Are regional variations in end-of-life care intensity explained by patient preferences?: A Study of the US Medicare Population. *Med Care* 2007;45:386–393. [PubMed: 17446824]
57. Rao JK, Anderson LA, Lin F-C, Laux JP. Completion of advance directives among U.S. consumers. *Am J Prev Med* 2014;46(1):65–70. [PubMed: 24355673]
58. Gamertsfelder EM, Seaman JB, Tate J, Buddadhumaruk P, Happ MB. Prevalence of Advance Directives Among Older Adults Admitted to Intensive Care Units and Requiring Mechanical Ventilation. *J Gerontol Nurs* 2016;42(4):34–41.
59. Sabatino CP. POLST: Avoid the Seven Deadly Sins. March 2018. Available at: [https://www.americanbar.org/content/dam/aba/administrative/law\\_aging/polst-article-apr-30-2018.authcheckdam.pdf](https://www.americanbar.org/content/dam/aba/administrative/law_aging/polst-article-apr-30-2018.authcheckdam.pdf). Accessed August 21, 2020.
60. Kruser JM, Cox CE, Schwarze ML. Clinical Momentum in the Intensive Care Unit. A Latent Contributor to Unwanted Care. *Ann Am Thorac Soc* 2017;14(3):426–431. [PubMed: 27997808]
61. Tolle SW, Teno JM. Counting POLST form completion can hinder quality. *Health Affairs Blog*, 7 19, 2018. Available at: <https://www.healthaffairs.org/doi/10.1377/hblog20180709.244065/full>. Accessed July 1, 2020.
62. Mehta AK, Blackhall LJ. Physician Orders for Life-Sustaining Treatment and ICU Admission Near the End of Life. *JAMA* 2020;324:608.
63. Barnato AE, Farrell MH, Chang CC, Lave JR, Roberts MS, Angus DC. Development and validation of hospital “end-of-life” treatment intensity measures. *Med Care* 2009;47(10):1098–1105. [PubMed: 19820614]

**Key Points:**

- We found moderate strength of evidence that limitations on POLST may reduce treatment intensity among seriously ill patients.
- The existing evidence base is entirely observational and limited in generalizability.
- We identify areas for future study to ensure that patients receive goal-concordant care.



**Why does this matter?**

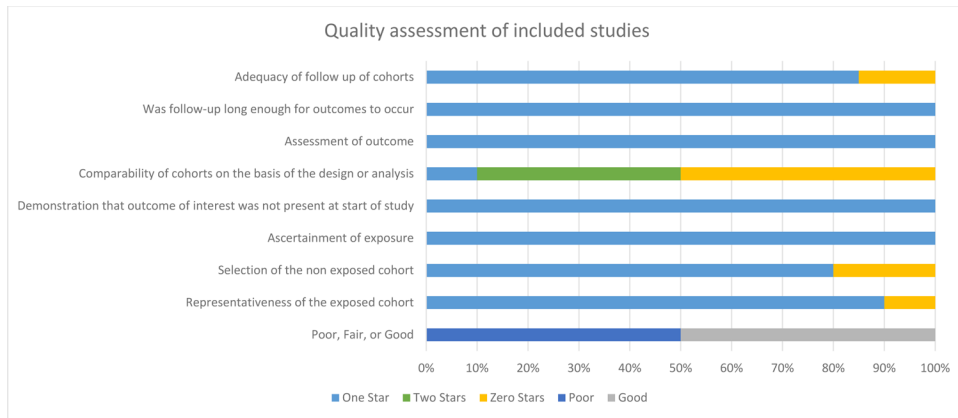
Substantial debate exists as to whether current level of evidence supports the safe and widespread implementation of POLST programs, and previous systematic reviews that assess the quality or strength of evidence supporting use of POLST do not exist.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript



**Figure 1.** Quality Assessment of Included Studies using the Newcastle-Ottawa Scale for Assessing the Quality of Nonrandomized Studies, Converted to Agency for Healthcare Research and Quality Standards of Good and Poor Quality

**Table 1.**

## Included Studies

Author, Year	Study Type	State	Setting	Patient population	Patients with POLST/Total No. of Patients
Araw et al, 2014	Descriptive	NY	Nursing facilities	Patients at nursing facilities with MOLST	161/180
Ballou et al, 2019	Retrospective cohort study	OR	Acute care	Trauma patients 65 presenting to Level 1 trauma center with and without POLST	192/3,342
Fromme et al, 2014	Retrospective cohort study	OR	Decedents	Decedents with and without POLST	17,902/58,000
Hammes et al, 2012	Retrospective cohort study	WI	Decedents	Decedents who died within 7- month period with and without POLST	268/400
Hickman et al, 2009	Retrospective cohort study	OR, WI, WV	Hospice	Decedents with POLST who had died within last 12 months	275/373
Hickman et al, 2010	Retrospective cohort study	OR, WI, WV	Nursing facilities	Patients (including decedents) aged 65 with POLST and minimum 60-day stay	817/1,711
Hickman et al, 2011	Retrospective cohort study	OR, WI, WV	Nursing facilities	Patients (including decedents) aged 65 with POLST and minimum 60-day stay	870/870
Hopping-Winn et al, 2018	Descriptive	CA	Advanced Care Planning Program	Deceased patients with and without POLST in Advanced Steps Program	253/300
Jennings et al, 2019	Retrospective cohort study	CA	Alzheimer's and Dementia Care Program	Decedents with and without POLST in Alzheimer's and Dementia Care Program	184/322
Lee, MA et al, 2000	Descriptive	OR	Managed Care Organization	Decedents with POLST enrolled in Program of All Inclusive Care	54/54
Lee, RY et al, 2020	Retrospective cohort study	WA	Acute care	Decedents with POLST who were hospitalized within 6 months of death	1818/1818
Lum et al, 2017	Retrospective cohort study	CO	Nursing facilities	Patients with heart failure admitted to skilled nursing facilities	278/370
Nugent et al, 2019	Retrospective cohort study	OR	Decedents in VA Health Care System	Decedents with and without POLST who had advanced stage lung cancer	77/346
Richardson et al, 2014	Retrospective cohort study	OR	Out-of-hospital and emergency department	Patients with out-of-hospital cardiac arrest	82/1577
Serrano-Eanelli et al, 2019	Retrospective cohort study	NY	Acute care	Patients 65 years admitted to the ICU	97/331
Tolle et al, 1998	Descriptive	OR	Nursing facilities	Patients with POLST orders for DNR and comfort measures	180/180
Tuck et al, 2015	Retrospective cohort study	OR	Community	Decedents with and without Parkinson's disease, with and without POLST	373/1,073
Turnbull et al, 2019	Prospective cohort study	MD	Acute care	Patients with DNR/DNI orders at time of hospital discharge, with and without MOLST	30/124
Vranas et al, 2019	Retrospective cohort study	OR	Acute care	Patients presenting to emergency department with and without POLST	1,769/26,128
Zive et al, 2019	Retrospective cohort study	OR	Acute care	Patients 65 with and without POLST transported to hospital by emergency medical services	1,412/7,055

POLST, physician orders for life sustaining treatment; MOLST, medical orders for life sustaining treatment

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 2.**

Selected Major Outcomes of Included Studies

Author, Year	Selected Major Outcomes		
Araw et al, 2014	<b>MOLST-Concordant Care:</b> Among those who had MOLST and died, 87% had wishes met		
Ballou et al, 2019	<b>No Treatment Limitations vs. Treatment Limitations on POLST:</b> <ul style="list-style-type: none"> <li>• Intubations outside of OR: 10% vs 11%, p&gt;.99</li> <li>• ICU admission: 61% vs 58%, p=0.69</li> <li>• Ventilator time: 5.5 vs 1.9 days, p&lt;0.001</li> <li>• ICU Length of Stay: 2.8 vs 1.7 days, p=0.008</li> <li>• Hospital Length of Stay: 4.8 vs 3.8 days, p=0.08</li> </ul>		
Fromme et al, 2014	<b>Odds Ratio for Dying in Hospital Depending on POLST Orders:</b> <ul style="list-style-type: none"> <li>• CMO: reference</li> <li>• Limited Treatment: 3.97 (95% CI, 3.59–4.39)</li> <li>• Full Treatment: 9.66 (95% CI, 8.39–11.13)</li> </ul>		
Hammes et al, 2012	<b>Hospitalization in Last 90 Days of Life Depending on POLST Orders:</b> <ul style="list-style-type: none"> <li>• CMO: 10%</li> <li>• Limited Treatment: 28%</li> <li>• Full Treatment: 70%</li> </ul>	<b>ICU admission in last 30 Days of Life Depending on POLST Orders:</b> <ul style="list-style-type: none"> <li>• CMO: 0%</li> <li>• Limited Treatment: 4%</li> <li>• Full Treatment: 25%</li> </ul>	<b>Place of death Depending on Presence of POLST versus no POLST:</b> <ul style="list-style-type: none"> <li>• Hospital: 11% vs 75%</li> <li>• Home: 16% vs 7%</li> <li>• Long Term Care: 68% vs 0%</li> <li>• Inpatient Hospice: 4% vs 36%</li> </ul>
Hickman et al, 2009	<b>Odds Ratio for Receipt of Life-Sustaining Treatment (reference = CMO orders on POLST):</b> <ul style="list-style-type: none"> <li>• Limited or Full Treatment 3.74 (95% CI, 1.81–7.72)</li> </ul>		
Hickman et al, 2010	<b>Odds Ratio for Receipt of Life-Sustaining Treatment (reference = CMO orders on POLST):</b> <ul style="list-style-type: none"> <li>• Limited Treatment: 1.73, p=0.03</li> <li>• Full Treatment: 3.03, p&lt;0.01</li> </ul>		
Hickman et al, 2011	<b>Percentage of Patients Receiving Treatment Concordant with POLST Orders:</b> <ul style="list-style-type: none"> <li>• Comfort Measures Only: 74%</li> <li>• Limited Intervention: 98%</li> <li>• Full Treatment: 100%</li> </ul>		
Hopping-Winn et al, 2018	<b>Percentage of Patients Receiving Treatment Concordant with POLST Orders:</b> <ul style="list-style-type: none"> <li>• DNR/Comfort Measures Only: 97%</li> <li>• DNR/Limited Interventions: 96%</li> <li>• DNR/Full Treatment 88%</li> <li>• CPR/Full Treatment: 100%</li> </ul>		

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Author, Year	Selected Major Outcomes	
Jennings et al, 2019	<b>Measures of Treatment Intensity During the Last 6 Months of Life (POLST vs No POLST)</b> <ul style="list-style-type: none"> <li>Any Hospitalization: 43% vs 31%, p=0.04</li> <li>&gt;1 Hospitalization: 22% vs 12%, p=0.02</li> <li>Median Hospital Length of Stay 5.8 days vs 4.1 days, p=0.22</li> <li>Any ICU Stay: 6% vs 4%, p=0.62</li> <li>Median ICU Length of Stay: 2.0 days vs 5.8 days, p=0.41</li> <li>Any Acute Care Event: 51% vs 39%, p=0.03</li> <li>&gt;1 Acute Care Event: 30% vs 18%, p=0.01</li> <li>Any ED Visit or Observational Stay: 29% vs 23%, p=0.27</li> </ul>	<b>Place of Death (POLST vs No POLST)</b> <ul style="list-style-type: none"> <li>Hospital or ED: 15% vs 16%, p=0.75</li> <li>ICU: 2% vs 3%, p=0.45</li> <li>Skilled Nursing Facility: 12% vs 12%, p=0.96</li> <li>Home: 70% vs 59%, p=0.04</li> <li>Hospice: 74% vs 62%, p=0.03</li> </ul>
Lee, MA et al, 2000	<b>Place of death (CMO vs Limited Intervention vs Full Treatment)</b> <ul style="list-style-type: none"> <li>Hospital: 0% vs 1.9% vs 0%</li> <li>Nursing Home: 5.6% vs 9.3% vs 1.9%</li> <li>Home: 18.5% vs 22% vs 5.6%</li> </ul>	<b>Percentage of Patients Receiving Treatment Concordant with POLST Orders:</b> <ul style="list-style-type: none"> <li>CMO: 62%</li> <li>Limited Intervention: 56%</li> <li>Full Treatment: 4%</li> </ul>
Lee, RY et al, 2020	<b>Treatment Intensity (CMO vs Limited Intervention vs Full Treatment)</b> <ul style="list-style-type: none"> <li>Admission to ICU: 31% vs 46% vs 62%, p&lt;0.001</li> <li>Delivery of life sustaining treatments: 14% vs 20% vs 43%, p&lt;0.001</li> <li>POLST-discordant intensive care: 30% vs 41% vs N/A</li> </ul>	
Lum et al, 2017	<ul style="list-style-type: none"> <li>Total receiving goal concordant care at hospital or ED: 95%</li> <li>Over-treated based on MOST: 5%</li> </ul>	
Nugent et al, 2019	<ul style="list-style-type: none"> <li>Adjusted odds ratio for hospice enrollment: 2.37 (95% CI, 1.01–5.54, p&lt;0.05)</li> <li>Adjusted odds ratio for death inside VA facility: 0.27 (95% CI, 0.12–0.59, p&lt;0.01)</li> </ul>	
Richardson et al, 2014	<b>Out-of-hospital procedures (No POLST vs DNR vs Resuscitate)</b> <ul style="list-style-type: none"> <li>Resuscitation attempt: 60% vs 22% vs 84%</li> <li>Advanced airway placement: 51% vs 12% vs 72%</li> <li>Cardioversion/defibrillation: 22%, 8% vs 22%</li> </ul> <b>Admitted to hospital (No POLST vs DNR vs Resuscitate): 17% vs 6% vs 38%</b>	
Serrano-Eanelli et al, 2019	<b>Care outcomes (eMOLST vs. No eMOLST)</b> <ul style="list-style-type: none"> <li>Direct costs: \$21,667 vs \$18429, p=0.10</li> <li>ICU costs: \$7718 vs \$6385, p=0.07</li> <li>Time in the hospital: 11.44 vs 9.85 days, p=0.09</li> <li>Time in the ICU: 113 vs 98 days, p=0.26</li> </ul>	
Tolle et al, 1998	<ul style="list-style-type: none"> <li>13% hospitalized, 85% of whom because suffering could not be controlled</li> <li>63% of 38 who died had narcotics ordered at the end of life</li> <li>No CPR, ICU care or ventilators among all patients</li> </ul>	



Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Author, Year	Selected Major Outcomes	
	<ul style="list-style-type: none"> <li>Place of death: 95% nursing home, 5% hospital</li> </ul>	
Tuck et al, 2015	<b>Place of death (POLST vs No POLST)</b> <ul style="list-style-type: none"> <li>Hospital: 7.5% vs 15.1%</li> <li>Home: 38.3% vs 27.9%</li> </ul>	<b>Place of death (CMO vs Limited/Full Treatment or No POLST)</b> <ul style="list-style-type: none"> <li>Hospital: 5.4% vs 14.7%</li> <li>Home: 39.1% vs 29.1%</li> </ul>
Turnbull et al, 2019	<b>Care outcomes (MOLST vs No MOLST)</b> <ul style="list-style-type: none"> <li>Median time to first DNR/I order: 16.4 vs 25.4hrs, p=0.1</li> <li>Median time from readmission to DNR/I order: 1.2 vs 27.1hrs, p=0.001</li> <li>Adjusted hazard ratio for DNR/I order at readmission: 1.43 (95% CI, 0.98–2.09)</li> <li>ICU admission: 27% vs 19%, p=0.44</li> </ul>	
Vranas et al, 2019	<b>Odds ratio for outcomes among patients with POLST (reference = no POLST)</b> <ul style="list-style-type: none"> <li>Hospitalization: 0.97 (95% CI 0.84–1.12)</li> <li>ICU admission: 0.82 (95% CI 0.55–1.22)</li> <li>High-intensity treatment: 1.06 (95% CI, 0.75 – 1.51)*</li> <li>Hospital mortality: 0.69 (95% CI, 0.45 – 1.04)</li> </ul>	<b>Odds ratio for outcomes among patients with limited treatment or CMO orders on POLST (reference = full treatment)</b> Hospitalization: 1.12 (95% CI 0.92–1.37) <ul style="list-style-type: none"> <li>ICU admission: 0.31 (95% CI 0.16–0.61)</li> <li>High-intensity treatment: 0.87 (95% CI, 0.5–1.52)*</li> <li>Hospital mortality: 1.78 (95% CI, 0.92–3.45)</li> </ul>
Zive et al, 2019	<b>Most common location of death</b> <ul style="list-style-type: none"> <li>Home: No POLST 43.6%, LI 38.3%</li> <li>SNF or LTACH: FT 38.9%</li> <li>Residential: CMO 53.4%, p&lt;0.01</li> </ul>	

POLST, physician orders for live sustaining treatment; MOLST, medical orders for life sustaining treatment; eMOLST, electronic medical orders for life sustaining treatment; ICU, Intensive Care Unit; LOS, length of stay; DNR, Do Not Resuscitate; DNR/I, Do Not Resuscitate/Intubate; CMO, comfort measures only; ED, emergency department; LTC, long term care; CPR, cardiopulmonary resuscitation; SNF, skilled nursing facility; LTACH, long term acute care hospital

\* high-intensity treatment defined as intubation or mechanical ventilation, tracheostomy, gastrostomy tube insertion, hemodialysis, enteral or parenteral nutrition, cardiopulmonary resuscitation, transfusion of blood products, or chemotherapy receipt (reference: Barnato AE, Farrell MH, Chang CC, et al. Development and validation of hospital “end-of-life” treatment intensity measures. *Med Care.* 2009;47:1098–1105).

**Table 3.**

## Population Characteristics of Included Studies

Characteristics <sup>A</sup>	N=27,090 <sup>B</sup> Mean or %
Age, years	78.7
Sex, female	55.3
<b>Race/Ethnicity</b>	
White	93.1
Black/Asian/Other	6.3
Hispanic	1.1
<b>State of Residence</b>	
Oregon	84.0
Washington	6.7
Wisconsin	3.1
West Virginia	2.4
California	1.6
Colorado	1.0
New York	1.0
Maryland	<1
<b>Comorbidities<sup>C</sup></b>	
Cancer	37.4
Pulmonary Disease	34.5
Cardiac Disease	33.5
Dementia/Neurodegenerative Disease	30.4
<b>Medical Intervention Preferences</b>	
Comfort Measures Only	55.3
Limited	30.4
Full	13.8

<sup>A</sup> One study (n=275) did not report age, One study (n=253) did not report sex, Five studies (n=823) did not report race/ethnicity, Seven studies (n=2,353) did not report any comorbidities, and three studies (n=181) did not report medical intervention preferences;

<sup>B</sup> Two patients with a POLST form designated a code status, but no medical intervention preferences and were excluded from analyses by study authors (Ballou et al.);

<sup>C</sup> Comorbidities are not mutually exclusive.

**Table 4.**

Questions Identified for Future Research.

Theme	Sample Questions
<i>WHO</i>	<ul style="list-style-type: none"> <li>• In whom should POLST be completed?</li> <li>• Are there specific patient populations (e.g., cancer, dementia) in whom POLST is most effective?</li> </ul>
<i>WHAT</i>	<ul style="list-style-type: none"> <li>• What level of training is necessary for clinicians who participate in POLST discussions and completion?</li> <li>• Do POLST orders reflect informed decision making between patients, their healthcare proxies, and clinicians?</li> </ul>
<i>WHEN</i>	<ul style="list-style-type: none"> <li>• At what point in disease trajectory should POLST be completed?</li> <li>• When should POLST orders be revisited with changing clinical status?</li> </ul>
<i>HOW</i>	<ul style="list-style-type: none"> <li>• How to ensure that POLST and other advance care planning documents are both accessible and interpretable by other clinicians?</li> <li>• How can clinicians and policy makers avoid exacerbating existing inequities in end-of-life care through POLST implementation?</li> </ul>

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript