

Implementation of a Novel Electronic Health Record-Embedded Physician Orders for Life-Sustaining Treatment System

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Abstract In April 2015, Oregon Health & Science University (OHSU) deployed a web-based, electronic medical record-embedded application created by third party vendor Vynca Inc. to allow real-time education, and completion of Physician Orders for Life Sustaining Treatment (POLST). Forms are automatically linked to the Epic Systems™ electronic health record (EHR) patient header and submitted to a state Registry, improving efficiency, accuracy, and rapid access to and retrieval of these important medical orders. POLST Forms, implemented in Oregon in 1992, are standardized portable medical orders used to document patient treatment goals for end-of-life care. In 2009, Oregon developed the first POLST-only statewide registry with a legislative mandate requiring POLST form signers to register the form unless the patient opts out. The Registry offers 24/7 emergency access to

POLST Forms for Emergency Medical Services, Emergency Departments, and Acute Care Units. Because POLST is intended for those nearing end of life, immediate access to these forms at the time of an emergency is critical. Delays in registering a POLST Form may result in unwanted treatment if the paper form is not immediately available. An electronic POLST Form completion system (ePOLST) was implemented to support direct Registry submission. Other benefits of the system include single-sign-on, transmission of HL7 data for patient demographics and other relevant information, elimination of potential errors in form completion using internalized logic, built-in real-time video and text-based education materials for both patients and health care professionals, and mobile linkage for signature capture.

Keywords Advance Care Planning · POLST · Third-Party EMR Integration

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Background

Physician Orders for Life Sustaining Treatment (POLST) Forms are standardized portable medical orders documenting patient wishes for those nearing end of life [1]. Multiple studies have confirmed a strong association between POLST Scope of Treatment Orders in Section B and the level of treatment patients receive [2–6]. Emergency medical personnel report that about a quarter of the time, POLST documents cannot be immediately located at the scene [7, 8]. To address this issue, in late 2009, the Oregon State Legislature funded the implementation of a POLST Registry so that orders could be immediately accessible to emergency medicine health care professionals treating patients in emergent situations. The legislation also mandates the submission of POLST Forms by the MD, DO, NP, or PA health care professional who signs

the form (or their designee) [9]. Implementation of the Registry allowed researchers and the Oregon POLST Task Force to quantify POLST form use across care settings. It also identified that more than 15 % of forms received contained some type of error. Errors include omissions (e.g., signature, date, missing or illegible signatures or dates of birth), and also, rarely, orders that are not medically feasible.

To address these potential completion errors, as well as to streamline documentation and availability of POLST Forms in a patient's electronic health record (EHR), an EHR-embedded electronic POLST form (ePOLST) completion was implemented at a single Portland, Oregon hospital, Oregon Health & Science University (OHSU). Here we highlight the technical development and pilot testing process of this ePOLST system, and describe data about use and error rates during early implementation.

ePOLST system development

Key goals of the ePOLST system design included a) facilitating error-free POLST form completion, b) providing patient- and healthcare professional-focused, real time education, c) effectively documenting end-of-life treatment goal discussions, and d) creating and recording patient preferences as medical orders. A third party vendor (Vynca) developed the ePOLST system with iterative feedback from OHSU and partners. The goals were to streamline submission of completed forms to the Oregon POLST Registry, and to create a specific consistent location within the EHR where POLST Forms could be located in a single click (per National POLST Paradigm Task Force recommendations) [10]. Because POLST Forms for OHSU patients are sometimes completed in settings using paper-based systems, an upload mechanism for scanned paper forms was also developed to support Health Information Management (HIM) groups and individual clinics.

Vynca completed the ePOLST system development. The OHSU Information Technology Group, Clinical Informatics Department, and EHR interface team facilitated implementation. The EHR vendor also participated in the project to support embedding the system into the EHR directly, allowing OHSU health care professionals to access the Vynca system within the EHR workflow to view, sign, or prepare a POLST

form based on their clinical role within the EHR, with no need for additional sign-on. Our institution uses the Epic EHR platform, but because the ePOLST system is an HL7-based integrated design, it is compatible with major acute and post-acute care EHR systems.

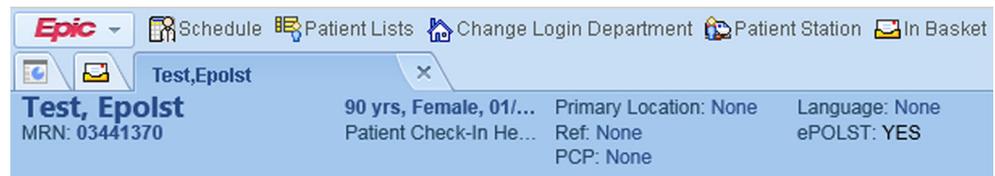
System specifications

When a POLST (scanned or electronically completed) has been entered into the ePOLST system, the patient header ePOLST link converts from "ePOLST no" to "ePOLST yes" (see Fig. 1). The web-based system utilizes a feed of ADT messages from the EHR when the ePOLST link is clicked within the patient header. The system responds and displays the current POLST on record and offers the opportunity to complete a new ePOLST or print a copy of the current form. So that this linkage was functional from early stages, just under 10,000 existing POLST Forms already held in the EHR as scanned documents were transferred into the ePOLST system, along with patient demographic data. Essentially, the forms are now stored in Vynca's secure cloud outside of the EHR, but the user is unaware of leaving the EHR environment when accessing them due to the seamless nature of the single sign on integration that the OHSU integration team and vendors were able to implement.

The clinical utility of the system was designed to support current health care professional workflow, while providing support for an effective conversation about end-of-life treatment orders and their meaning. The provider experience of using the ePOLST form is smooth, within the context of a patient encounter. The system provides educational content, and helps to drive what can be a difficult conversation, using easy to read graphics. The form cannot be saved until it is completed, which prevents the provider from accidentally submitting the form before it is valid. The HIM workflow was also streamlined to support upload of scanned paper forms directly into the ePOLST system so as to not be "lost" in various sections of a patient's medical record and to enhance retrieval with a single click.

The system includes mobile connectivity for capturing real-time signatures from both health care professionals completing the form, as well as patient and/or

Fig. 1 The Epic Systems™ OHSU Proof of Concept patient header with ePOLST link



patient surrogate(s) present for the discussion. The Vynca patent pending mobile linkage works by connecting any smart device (phone, tablet, etc.) and desktop session so the user can capture of signatures on the screen of the smart device using a finger or stylus in the integrated secure system of the EMR. The mobile connectivity feature also allows the display of video-based educational information for patients. This feature is important given potential logistical limitations of the EHR (browser challenges), lack of hardware to capture signatures (no signature pads), or the environment (many computers in clinical environments have no audio functionality).

Testing and implementation activities

While securing institutional resources is critical, another valuable step, capturing “real estate” on the patient header of the EHR, had actually been completed years earlier at OHSU in the outpatient setting with linkage to scanned paper forms. This header connectivity was included for inpatient services with the launch of ePOLST. A separate yes/no tab was created for advance directives to improve retrieval within the EHR system (see Fig. 1). Because advance directives are not medical orders and thus cannot be honored by emergency medical personnel they are not part of the Oregon POLST Registry system. However, linking documents to the header is essential in any system considering an ePOLST or other POLST streamlining and storage system.

Once an initial ePOLST product had been built and the messaging structure was in place, we initiated an iterative testing process by over forty clinical and HIM staff and faculty on a Proof of Concept (POC) EHR site with sham patient data. The evaluator generated scenarios for the health care professional to consider when interacting with the ePOLST system and allowed the user to proceed with little or no feedback. Then comments were captured using both free-text and survey methodology. Through this testing process, both critical system fixes and requested features were identified and implemented by the vendor. System champions, including medical informaticists, provided key insights into improving the usability of the system, such as user interface edits, color coding of order selections, development of appropriate error or alert messages, and review of educational materials. A secure direct transfer mechanism of completed forms to the Oregon POLST Registry was also implemented, assuring the forms completed by OHSU health care professionals were received by the Registry, per legislative mandate. Given the critical nature of POLST Forms, it is important for them to be registered immediately after completion, and to become available instantly for emergency access [11].

System piloting

In April 2015, the ePOLST system was launched in the live, production EHR. Metrics of interest for evaluation included system use, form volume, form validity, HIM and clinical workflow, and time spent within the system, including time spent viewing real-time educational media embedded within the process. In the first 6 months (pilot phase) of use, the ePOLST link was clicked from a patient header nearly 12,000 times. During the pilot (April–October 2015), just under 800 POLST Forms were received through the ePOLST system by the Oregon POLST Registry, and of these, 291 were completed electronically. Paper POLST Forms were uploaded through the HIM portal, also accessible from the ePOLST tab on the patient header and directly submitted to the Registry. Because no completion errors were present in the electronically completed POLST forms, they could be filed immediately into the Oregon POLST Registry.

During the 6 month pilot phase, evaluators identified that ongoing education regarding the new application was critical. OHSU, Vynca, and the Center for Ethics in Health Care at OHSU (the administrative home of the Oregon POLST program) developed training materials and video modules to support health care professionals in ePOLST use. These included a video module documenting the process of mobile linkage and a link to a site to practice ePOLST completion. As soon as these were released, ePOLST use increased substantially, with 269 electronically completed forms and 170 scanned forms received in the last 2 months of 2015 alone. Compared to April–December of 2014, submission volume to the Oregon POLST Registry from OHSU more than doubled, and every form completed electronically had no completion errors.

Conclusion

While additional evaluation is underway, the implementation of this novel ePOLST system at OHSU has been successful as a tool for improving workflow efficiency, effective completion of error-free POLST Forms, providing immediate access to orders, and assuring direct and timely submission to the statewide Registry.

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