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Research Article

Default settings of computerized physician order entry system order sets drive ordering habits

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Abstract

Background: Computerized physician order entry (CPOE) systems are quickly becoming ubiquitous, and groups of orders ("order sets") to allow for easy order input are a common feature. This provides a streamlined mechanism to view, modify, and place groups of related orders. This often serves as an electronic equivalent of a specialty requisition. A characteristic, of these order sets is that specific orders can be predetermined to be "preselected" or "defaulted-on" whenever the order set is used while others are "optional" or "defaulted-off" (though there is typically the option is to "deselect" defaulted-on tests in a given situation). While it seems intuitive that the defaults in an order set are often accepted, additional study is required to understand the impact of these "default" settings in an order set on ordering habits. This study set out to quantify the effect of changing the default settings of an order set. **Methods:** For quality improvement purposes, order sets dealing with transfusions were recently reviewed and modified to improve monitoring of outcome. Initially, the order for posttransfusion hematocrits and platelet count had the default setting changed from "optional" to "preselected." The default settings for platelet count was later changed back to "optional," allowing for a natural experiment to study the effect of the default selections of an order set on clinician ordering habits. **Results:** Posttransfusion hematocrit values were ordered for 8.3% of red cell transfusions when the default order set selection was "off" and for 57.4% of transfusions when the default selection was "preselected" ($P < 0.0001$). Posttransfusion platelet counts were ordered for 7.0% of platelet transfusions when the initial default order set selection was "optional," increased to 59.4% when the default was changed to "preselected" ($P < 0.0001$), and then decreased to 7.5% when the default selection was returned to "optional." The posttransfusion platelet count rates during the two "optional" periods: 7.0% versus 7.5% – were not statistically different ($P = 0.620$). **Discussion:** Default settings in CPOE order sets can significantly influence physician selection of laboratory tests. Careful consideration by all stakeholders, including clinicians and pathologists, should be obtained when establishing default settings in order sets.

Key words: Default settings, test utilization, order sets

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INTRODUCTION

Computerized physician order entry (CPOE) systems have become commonplace in the hospital setting. By having physicians input the order for laboratory testing or medications, errors can be reduced.[1] At the Hershey Medical Center, most inpatient orders are placed through the computerized order entry system (CPOE). As with most CPOE systems, orders may be grouped into order sets, which allow for the clinician to select from a group of orders that commonly are ordered together, typically grouped as condition-specific or situation specific. Each order can be optional or required though the setting can be changed for a specific situation. Several studies have described the utility of order sets,[2-4] as well as methods for setting up order sets that incorporate evidence based guidelines,[5,6] or order sets which deliver decision support to the clinician at the time of order.[7,8]

While it may be intuitive that a change to the default settings of an order or order set would drive practice towards the new default setting, this study aimed to quantify the magnitude of the change in ordering practice when the default settings are changed.

There have been several studies and reviews demonstrating that using a CPOE system has an effect on physician ordering habits.[9-13] Clinical decision support, which can manifest functionally in ways such as simple reminders, display of charges, restricted lists or display of test results all affect laboratory utilization patterns.[9,13] Another study[5] has considered the impact of changing default settings in an existing order set, in order to reduce the variability in clinical practice.

At our institution, the clinical pathologists review order sets for appropriate laboratory utilization and suggest default settings. When an order is defaulted as "preselected" the order will be placed unless the clinician intervenes and deselects the order; when an order is defaulted "optional" the clinician has to actively select and "turn on" the order for it to be placed through the order set. Recently, the order sets used for a transfusion of red blood cells (RBCs) or platelets were reviewed.

Previously, the order sets included orders for a posttransfusion hematocrit or platelet count as appropriate. These orders were previously defaulted "optional," so for a clinician to order a posttransfusion hematocrit or platelet count from the order set, an extra action of selecting the appropriate order was required. The order in each set was changed to default "preselected," so a hematocrit or platelet count order was placed unless the clinician specifically and actively "turned off" the test [Figure 1]. Due to clinician concern, after approximately 3 months, the default setting for platelet count in the platelet transfusion order set was reverted to "optional" whereas the default setting for hematocrit in the red cell transfusion order set continued to be "preselected." The clinician concern leading to the reversion of the platelet transfusion order set the original state was that the additional posttransfusion platelet count orders were generating too many central line blood draws and would lead to an increased occurrence of central line infections, especially in the hematology/oncology patient population. This concern had not been taken into account when changing the default order status, and resulted in the return to a default of "optional" for the posttransfusion platelet count order.

No changes in the indications, or recommendations occurred in the period prior to or after the intervention as to whether or not to obtain a posttransfusion hematocrit or platelet count. The change in the default setting of these tests presents a natural experiment to determine the effect of this setting in an order set on test utilization. While it may seem intuitive that preselecting a laboratory test in an order set would increase the rate at which it is ordered, there is very little published information as to the magnitude of this change. Because of the lack of evidence-based or consensus guidelines to the need for a posttransfusion hematocrit or platelet count, we are effectively determining the impact on changing default settings with little effect from other confounding variables.

METHODS

The Penn State Milton S. Hershey Medical Center is a medium sized (approximately 550 bed) academic medical facility, with a widely utilized electronic health record utilizing the Cerner Connected Power chart (Cerner Corporation, Kansas City, MO, USA) product. There are over 500 residents and fellows, and trainees enter the majority of orders for blood products. This EMR product allows for groups of orders to be specified into "order sets." For example a set of orders including "type and screen," "crossmatch," "transfuse packed RBCs (RBCs)" and "draw hematocrit posttransfusion" are grouped into an order set entitled "RBC transfusion." Orders in an order set can be defaulted to "preselected" meaning that the order will be placed when the orderset is used without

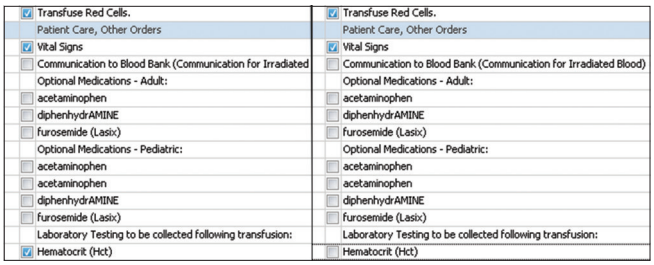

Figure 1: The "transfuse red cells" order set prior (left) and after (right) the intervention. The default value for the order "posttransfusion hematocrit" was changed from optional to preselected

additional intervention by the clinician. When an order is defaulted "optional" the order will not be placed by the orderset unless the clinician takes steps to select it.

For quality improvement purposes, order sets dealing with transfusions of RBCs and platelets were recently reviewed and modified with the goal of improving the monitoring of the transfusion outcome. Initially, the order for posttransfusion hematocrits and platelet counts had the default setting changed from "optional" to "preselected." The default settings for platelet count was later changed back to "optional," allowing for a natural experiment to study the effect of the default selections of an order set on clinician ordering habits.

A retrospective review of hematocrit and platelet count orders generated from the RBC and platelet count order sets was performed. Using the Business Objects Web Intelligence software (SAP, Newton Square, PA, USA), a query of the Cerner Connected Powerchart CPOE system was performed for all orders for transfusion of RBCs, transfusion of platelets, hematocrit orders and platelet count from January 6, 2012 until January 2, 2013. Each individual order was then collated by transfusion event if a hematocrit or platelet count was placed using the same order set. The number of hematocrit or platelet count orders placed using the corresponding order set was compared to the total number of times the transfusion orderset was used both in the time frame prior to when the changes were made, and after the changes were made. Hematocrit orders and platelet count orders were considered to be placed at the same time as the transfusion order if the orders were placed at the same time ± 5 min as the transfuse order from the orderset was placed. This allows a determination of the magnitude of the effect of changing the default settings of the orderset on ordering habits.

Using STATA (STATA Corp LP, College Station, TX, USA) both descriptive statistics as well as Chi-squared tests for significance were performed. Significance was set at $P < 0.05$.

RESULTS

During the study, there were 7578 orders for RBC transfusion. In the preintervention period when the default value for the posttransfusion hematocrit order was set to "optional," only 266 (8.3%) of 3197 total RBC transfusion orders had a posttransfusion hematocrit ordered. In the postintervention period, 2521 (57.5%) of 4381 total RBC transfusions had posttransfusion hematocrits. There was a significant difference between the rate of getting a hematocrit prior to the intervention and postintervention $P < 0.0001$ [Table 1 and Figure 2].

During the study, there were 3285 total orders for platelet transfusion, of which 891 had orders for posttransfusion platelet counts placed using the same order set. Prior to the intervention, only 91 (7.0%) of 1312 platelet transfuse orders included a posttransfusion platelet count order. When the platelet count was defaulted to "preselected," 746 (59.4%) of 1256 platelet transfusion orders included a posttransfusion count. After the default value was switched back, 54 (7.5%) of 717 platelet transfusion orders included a posttransfusion count. There was a significant difference in the rate at which posttransfusion counts were obtained between the intervention periods and when the platelet count was defaulted "optional" and "preselected ($P < 0.001$). There was no difference between the rate of posttransfusion counts in the pre and postintervention periods ($P = 0.620$) [Table 2 and Figure 3].

DISCUSSION

The rate of transfusions with posttransfusion labs increased approximately five-fold when the default changed from "optional" to "preselected." This same change in the opposite direction was seen again when the platelet count default was switched back from "preselected" to "optional." This change in ordering habits can be attributed directly to the state of the order

Table 1: The number of red cell transfusion orders placed with and without a post transfusion hematocrit order

	Default setting of hematocrit order		
	Optional (%)	Preselected (%)	Total
Transfusion order alone	2931 (91.7)	1860 (42.5)	4791
Transfusion and hematocrit order	266 (8.3)	2521 (57.5)	2787
Total	3197	4381	7578

The rate at which hematocrit orders were placed was significantly higher when the default is set to "preselected" ($P<0.0001$)

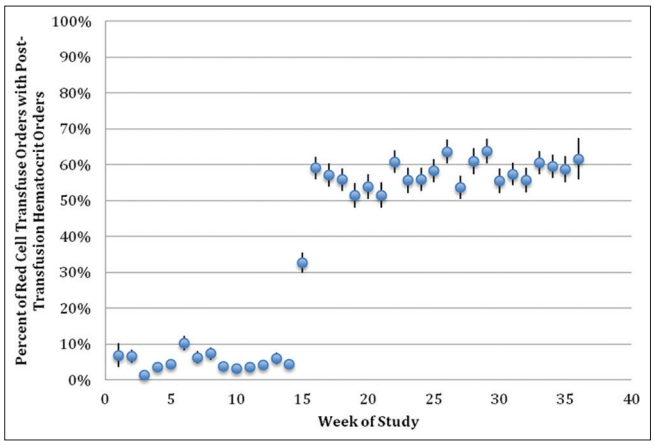

Figure 2:The percent of red cell transfuse orders with an associated posttransfusion hematocrit ordered. The intervention occurred mid-week during week 15. Error bars are set at ±1 standard error

Table 2: The number of platelet transfusion orders placed with and without a posttransfusion platelet count order

	Default setting of platelet count order (%)			Total
	Optional	Preselected	Optional (post preselected)	
Transfusion order alone	1221 (93.0)	510 (40.6)	663 (92.5)	2394
Transfusion and platelet count order	91 (7.0)	746 (59.4)	54 (7.5)	891
Total	1312	1256	717	3285

The optional (post-pre-s\selected) column refers to the study period in after the platelet count order was changed back to it's original "optional" setting after being defaulted to "preselected" for several weeks. There is a significant difference in the rate of which transfuse orders were placed when the default is set to "preselected" $P<0.001$. The rate during the "optional" periods is the same, $P=0.620$

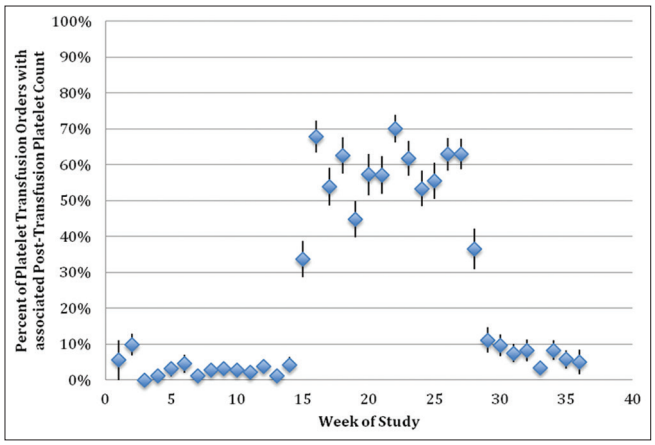

Figure 3: The percent of red cell transfuse orders with an associated posttransfusion hematocrit ordered. The intervention to change the default to "preselected" occurred mid-week during week 15, and the default was switched back to "optional" mid-week during week 28. Error bars are set at ±1 standard error

default in the order set. This is a dramatic change in ordering habits, brought on by a very simple change in the CPOE.

Lack of a posttransfusion laboratory evaluation does deprive the clinician of information that could be useful to assess the response to the transfusion or the need for further treatment. However, the laboratory value is only a part of what should be considered when making the decision to transfuse a patient. Because of the lack of guidelines as to whether a posttransfusion hematocrit or platelet count is necessary, and the lack of an unquestionable "need" for posttransfusion laboratory evaluation in all situations, the 50% jump in ordering is due to the clinicians accepting the order set defaults.

Some of the change in ordering habits may be due to the setting the study was conducted in. In an academic hospital where residents do the majority of the ordering, the default settings in an order set may be more often unquestioned than in other settings where physician ordering habits are more entrenched.

Interestingly, when the platelet count order was reverted back to "optional" after several months of being "preselected," the percent of platelet transfusions with posttransfusion platelet counts dropped to the preintervention rate. This gives weight to the idea that the order sets are being followed with little thought to what is actually needed by the specific clinical context. This observation may have very important implications to laboratory utilization.

Because of the large impact in ordering habits, careful thought must be given to whether or not to make an item in an orderset defaulted as "preselected" or "optional." Although it is readily apparent that preselected tests can result in increased levels of unnecessary testing, a balance between over-testing and under-testing a patient population must be achieved.

In our review of order sets, we are acutely aware that those tests that are almost always obtained on every patient should be preselected; the burden associated with missing that order – the effort necessary to add on the test if an appropriate sample was drawn or to re-draw the patient to obtain the necessary sample – far exceeds the few instances where the test was not necessary but not "de-selected."

Changing the default settings of an order set can have a profound impact in test utilization, which should consider both decreasing unnecessary tests as well as ensuring that test results are available that are necessary for decision-making in the situations that these order sets are designed to serve. With every benefit, there is a cost; therefore both clinicians and laboratory medical directors must be involved in the development and effective implementation of these order sets.

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