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Using clinical decision support tools to increase defibrillator deactivations in dying patients

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INTRODUCTION

Inadvertent automatic implantable cardioverter defibrillator (AICD) shocks at the end of life are distressing and should be avoided.[1 2] Up to 65% of AICDs are active and up to 33% of patients with AICDs receive shocks within 24 hours of dying.[3] Though guidelines encourage device discussions, one study demonstrated only 27% of clinicians brought up AICD deactivation.[2 4] Since the Health Information Technology for Economic and Clinical Health Act was passed in 2009, clinicians and IT professionals introduced evidence-based clinical decision support (CDS) models into patient care, including order sets and alerts.[5] Our group was the first to demonstrate that educational sessions paired with a novel CDS tool in the electronic medical record (EMR) significantly improved the rates of AICD deactivation discussions and of shock function deactivation.[6] However, a criticism was that the labour-intensive teaching sessions drove most of the improvement and EMR modifications are ineffective. As a result, we sought to investigate whether the CDS tool alone invoked more AICD deactivation discussions and AICD deactivations.

METHODS

We conducted a retrospective chart review of hospitalised comfort care patients from April 2018 to April 2019 (n=46) at another academic medical centre within our hospital enterprise that uses the same EMR. The novel CDS tool was activated in October 2018 within the 'comfort care' order set, which directs providers to focus on symptom-based treatment. Primary providers were prompted to address AICD deactivation planning by selecting one of three options in a drop-down menu—'N/A patient does not have an AICD', 'patient or decision-maker declines AICD deactivation at this time. Do not deactivate AICD', and 'patient or decision-maker gives consent for AICD deactivation. Deactivate AICD' (figure 1). No education or announcements of the CDS tool were made. The rates of AICD deactivation discussions (identified in a progress note) and AICD deactivations (presence of a deactivation note) were compared between the 6-month periods before (n=18) and after (n=28) CDS tool implementation. Fisher's exact test was performed for comparison with a type I error cut-off of 0.05.

RESULTS

Prior to implementing the CDS tool, 77% of patients underwent AICD deactivation discussion and 39% AICD deactivation (table 1). In 6-month postintervention, the rate of AICD deactivation discussions improved to 96%, nearing statistical significance (p=0.06). The rate of deactivated AICDs improved to 75% (p=0.02). Feedback from clinicians using this tool suggested that it was valuable and did not disturb standard workflow.

DISCUSSION

In this study, we investigated whether a standalone CDS tool within the EMR could precipitate practice changes. Our data build on the

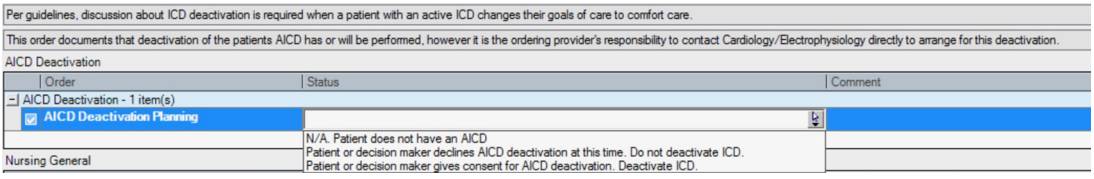

Figure 1 Screen capture of our group's clinical decision support tool within the electronic medical record.

Table 1 Improvement in ICD deactivations and ICD deactivation discussions after implementation of novel CDS tool in EMR*

QI measure	Pre-CDS implementation	Post-CDS implementation	P value
ICD deactivation occurred	7	21	0.02
ICD deactivation did not occur	11	7	
ICD deactivation discussion occurred	14	27	0.06
ICD deactivation discussion did not occur	4	1	

* Created by authors. **Using Fisher's exact test.
CDS, clinical decision support; EMR, electronic medical record; ICD, implantable cardioverter defibrillator.

work of Sandhu and Matlock, who proposed a CDS tool to improve AICD deactivations, revealing that a properly implemented CDS tool adds value.[7] Similar tools have been successfully applied with associated improvement in quality metrics, including reduced length of hospital stay and fewer adverse drug events.[8 9]

Some argue against association of EMR-based CDS tools and better quality, raising concerns over their ability to improve healthcare delivery.[10] Inefficacy may reflect suboptimal design; missing or poor positioning of key elements can render a tool useless.[11] Alert fatigue may provoke failure to recognise areas to optimise healthcare performance.[12] We demonstrate improved outcomes through successful application of an intuitive CDS tool that prompts users to reconcile AICD deactivation planning at an appropriate juncture without disrupting workflow. Our tool was widely accepted and valuable without inundating providers with clicks, notifications or training modules, highlighting the importance of integration into existing systems. We conclude that continued provider education may be unnecessary to improve AICD deactivations in the presence of our CDS tool.

We note that 60% of patients who die at our institution receive comfort care orders, demonstrating a high yield for this CDS tool. Though another significant portion of deaths occur unexpectedly, these patients were not the targets of this intervention. In contrast, patients focused on comfort measures were appropriate candidates for AICD deactivation.

Limitations of our study include that it was conducted within a single hospital system, it lacked a control group, and there was a paucity of data on unintended AICD shock rates. Future directions involve analysing data about provider utilisation of the CDS tools, such as click patterns and time spent within an order set, to optimise design. Finally, expanding use of this CDS tool at other institutions and to patients who note a preference to not be resuscitated may encourage similar conversations to undergo upstream of end-of-life care.

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Contributors The authors confirm contribution to the paper as follows: study conception and design: RK, JDG and MPW; data collection: RK and MPW; analysis and interpretation of results: RK, DYC, JDG, JIL, MPW; draft manuscript preparation: RK, DYC, JDG, JIL, MPW. All authors reviewed the results and approved the final version of the manuscript.

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