Economic Impacts of Artificial Intelligence (AI)-Based Risk Analytics for Early Detection of Clinical Deterioration in a Pragmatic Randomized Controlled Trial

HSD94

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INTRODUCTION

- Late identification of clinical deterioration is a significant source of morbidity and mortality among hospitalized patients.
- Very few AI systems targeting early signatures of illness to prevent clinical deterioration have been implemented in practice, and these systems' economic impacts need to be better understood.
- The Continuous Monitoring of Event Trajectories (CoMET) is an AI-based visual analytic that displays the risk of clinical deterioration and is updated every 15 minutes in acute and intensive care hospital units.

OBJECTIVE

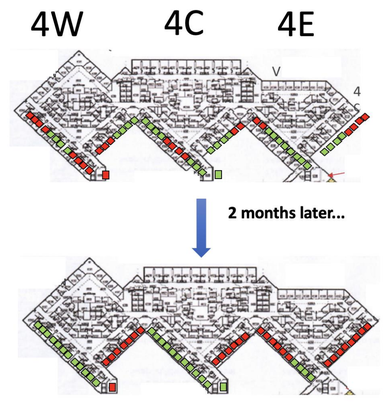
- The CoMET system was tested in a large pragmatic cluster randomized controlled trial in an acute care cardiology ward from 2020-2022 to assess the impact on hours free of events of clinical deterioration, time to proactive clinical action, and the economic impacts of the implementation and use of the CoMET system.
- Here, we assessed the impact of the CoMET system on hospital charges (what insurance is billed) and costs (what insurance pays) in a USA health care context.

METHOD

- CoMET was implemented and integrated in an academic US hospital into routine clinical care workflows with suggested responses but no mandated protocol.
- The randomization arms were considered intention-to-treat
- Hospital charges and costs were obtained through hospital financial reporting.
- Generalized linear models were constructed to assess the relationship between the trial arm (AI-risk display versus standard of care) on cost outcomes in both the full cohort and in those at-risk of clinical deterioration.

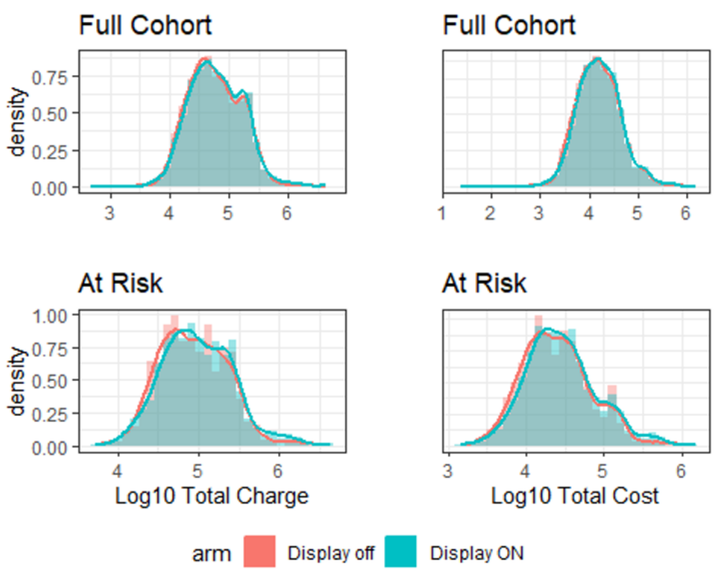
Figure 1.

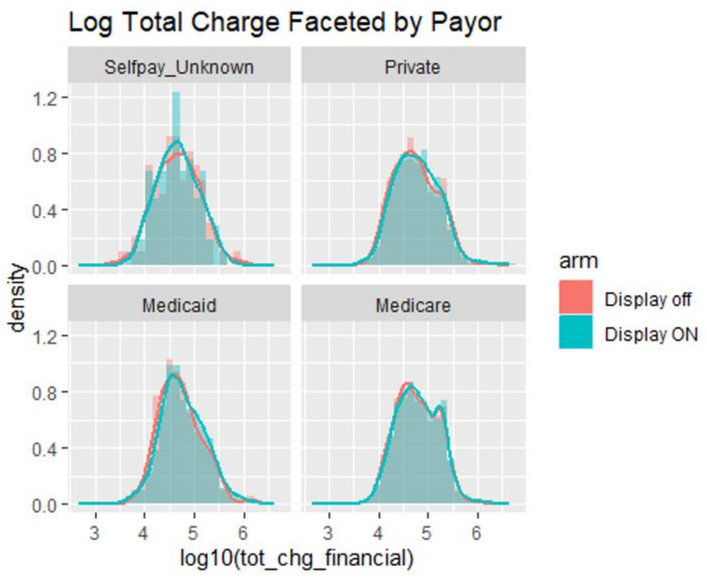
CoMET artificial intelligence–based visual risk analytic. CoMET: Continuous Monitoring of Event Trajectories.



RESULTS

- 10,422 patients were included in the pragmatic RCT. The majority of the sample was male (58%), white (75%), with an average length of stay 2.7 days in the acute care cardiology/surgical setting.
- There was evidence of differences in cost outcomes for the entire admission ranging from 10-22% differences by study arm favoring standard of care (display off) in both cohorts.
- In the full cohort, the mean total cost was $26,635 for the standard of care (display off), and $29,309 for the intervention arm (display on). The difference has a p-value of 0.023.
- In an at-risk group that had larger physiological variations and a rise in the CoMET score over 2, there was also a statistically significant in cost difference favoring the intervention arm.
- In post hoc analysis among patients who had bed changes, we noted that there was a higher patient acuity among those transferred to an AI-risk display bed, thereby undermining the random nature of assignment in this real-world pragmatic design.
- This movement of sicker patients to intervention beds likely contributed to the findings.





Left: Charges (log10) and costs (log10) for both the intervention and standard of care group demonstrated similar distributions

Right: Charges (log 10) shown for each payer for both the intervention and standard of care group demonstrated similar distributions.

CONCLUSIONS

- Studying the economic consequences of AI-based risk scores and early warning systems remains challenging.
- There is a real possibility that early warning drives proactive action that results in earlier and longer interventions with improved patient and clinician outcomes.
- Further, costs and charges linked to the entire hospital stay might not be the most important economic marker of effectiveness.
- Developing nuanced simulation models can help health systems determine the resource impacts prior to implementation.

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