**TITLE**

Radiology Clinical Decision Support Tool for Appropriate Use Criteria: A Retrospective Cost-Benefit Study

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**ABSTRACT**

Appropriate Use Criteria Clinical Decision Support (AUC CDS) was legislatively mandated in 2014 to guide clinicians to select appropriate imaging modalities based on clinical indication. We evaluated the effectiveness of an AUC CDS system and its time costs on clinicians.

AUC CDS audit logs from our Electronic Health Record (EHR) were queried to calculate CDS positive predictive value (PPV), time costs, and the cost-benefit ratio of minutes of provider time per altered order. Alerts were queried from our medical center between July 1, 2021, and June 30, 2022, obtaining encounter type, recipient provider type, original order, final order, timestamps of when the alert fired, when the CDS rendered on screen, and when the user clicked on the alert. We conducted two a priori subgroup analyses of practice environment and provider type. Time costs of alerts were quantified, and two timespans were calculated: CDS load time (user notification minus system trigger timestamp) and CDS dwell time (acknowledgement minus notification timestamp). The cost-benefit ratio of CDS was defined as aggregate CDS time over changed clinical decisions. Aggregate CDS time was defined by multiplying the trimmed mean by the number of alerts. We used SQL Server Management Studio for data retrieval and Python for data analysis.

The AUC CDS alert was triggered 94,037 times, 218 alerts resulted in a cancelled order (0.2%), and 740 alerts resulted in a changed order (0.8%). Median time costs per alert showed a 12 second load time and 2 second dwell time, yielding a CDS cost/benefit ratio of 38 provider minutes per altered order. Overall PPV was 1%. Variation in PPV across outpatient (1.7%), inpatient (0.3%), emergency (0.2%), yielded a range of CDS cost/benefit ratios, from 24 provider minutes per altered order in outpatient to 213 provider minutes per altered order in emergency departments. PPV across provider types were 0.6% resident/fellow, 1.2% attending, 1.2% APP. Variation in dwell times between trainees and non-trainees gave a range of CDS cost/benefit ratios, from 29 provider minutes per altered order for attendings to 73 provider minutes per altered order for residents/fellows.

Our local AUC CDS demonstrated low PPV, long load times, and short dwell times. AUC CDS was ineffective and costly in terms of provider time. Policymakers should consider the effectiveness and cost of CDS when designing AUC policy.