

## Suitability of clinical workflows for automation

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### ABSTRACT

There is increasing interest in using information technology to support healthcare workflows; however not all workflows are suitable for automation. We developed two metrics, enacted complexity (EC) and contextual dependence (CD), to identify and rank clinic workflows on their amenability for automation. EC is a function of the number of paths in a workflow; more paths indicate greater complexity. CD is a function of how much a workflow is influenced by contextual specifics. High CD indicates that a workflow greatly depends on when, where, and by whom it is performed. EC and CD are indicators that a workflow may be difficult to map, monitor, and control, suggesting that the workflow is a less feasible target for automation. In this study, we computed EC and CD using clinical documentation data from the electronic medical record (EMR) for 143,347 visits from 24 different outpatient clinics (Dermatology, Orthopedic Surgery, and Pediatric Oncology). Surgical Pathology data were included as a simple workflow comparator. We used EC and CD to rank order the clinics for automation suitability. EC and CD showed strong correlation (Spearman  $r = 0.55$ ,  $p < 0.05$ ). Surgical Pathology workflow consisted of a handful of paths and is very nearly context independent. In contrast, Dermatology clinics had over 167,000 paths and Orthopedic Surgery clinic had millions of paths. Both Dermatology and Orthopedic Surgery workflows were highly context dependent. Although Dermatology clinics were extremely complex, they appeared more amenable to automation than the other outpatient clinics. We conclude that the two metrics, EC and CD, can identify healthcare workflows that are suitable for and may benefit from automation. This research was supported by NSF (SES-1734237), University of Rochester CTSA (UL1 TR002001).