Risk Stratification Algorithms to Identify Chronic Disease Rehospitalisation

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SUMMARY OF INNOVATION

• Key Problem
  • Despite several risk stratification algorithms being proposed in recent years, there is limited use of these algorithms in hospital services to identify patients for enrolment into these intervention programs.

• Aims of this Innovation
  • To develop and validate prediction models for identifying chronic disease patients with a high risk of unplanned clinically relevant return within 30 days of discharge from hospital.

• What we did
  • Excluded episodes that were not clinically relevant
  • Developed and validation models to predict 4 response variables representing readmission and/or re-presentation to hospital within 30 days of discharge.

• Outcomes
  • Despite excluding several types of episodes representing easily predictability, we have developed reasonably good models that exhibit good discrimination ability while serving the task of addressing only clinically relevant cohorts of patients returning to hospital.
KEY PROBLEMS

• While several models have been proposed over recent years for predicting the risk of hospital readmission\(^1\), the performance of most has been found to be sub-optimal and very few are actively used in hospital settings for risk stratification.

• In pursuing the application of recent risk stratification algorithms we developed\(^2\), we identified that several patient cohorts included in our analysis, and in other models proposed around the world, were of low relevance to clinicians seeking to identify patients for these interventions.


AIM OF THIS INNOVATION

• To employ routinely collected administrative and clinical information for chronic disease patients belonging to a lower socio-economic region of Queensland, Australia,

• To develop and validate prediction models for identifying patients with a high risk of unplanned non-routine clinically relevant readmission, re-presentation, or return (readmission or re-presentation) within 30 days of discharge from hospital.
METHODOLOGY

• Inpatient admission and emergency presentation data from 2005-2010 for patients residing in a lower socio-economic area of Queensland, Australia.

• The study focused on the patient cohort that had at least one chronic disease admission during the analysis period.

• Episodes identified as routine or clinically non-relevant were excluded from modelling and validation but the information captured for profiling patients.

• Four response variables were chosen:
  – RA30 - Return as an admitted patient within 30 days of discharge,
  – RA30E - Return as an admitted patient through emergency within 30 days of discharge
  – RP30 - Re-presentation at ED within 30 days of discharge,
  – RU30 - Return to hospital as either an admission or emergency presentation within 30 days of discharge.

• Three algorithms were employed for model development - generalised estimating equations (GEE), artificial neural networks (ANN), and random forests (RF).
OUTCOMES

• Reasonably good models can still be developed for predicting clinically relevant return to hospital.

• Excluding admissions that are operationally less relevant from the modelling, it is hoped that the risk stratification algorithms will be more meaningful for clinicians and possibly lead to these being incorporated in discharge planning.

• We are currently discussing a trial of these models at a local health service to identify candidates for an intervention program targeted at reducing rates for unplanned admission and ED presentation among chronic disease patients.
Thank you

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