Sydney Triage to Admission Risk Tool (START)
An update

Michael M Dinh
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- Sydney Local Health District
- Emergency Care Institute and ACI
- The George Institute for Global Health
- The University of Sydney
It is your DESTINY

Demand for Emergency Services Trends in Year 2010-14
DESTINY

- Characterising and mapping ED demand
- Data modelling
Studies to date 2015-17

- Overall trends
- Representations
- Ambulance presentations
- Low acuity presentations
- Injury trends
- HEAT maps
- Mental health trends
- 100+ study
- Triage presenting problems
- Influenza and ED performance
Figure 2. Mean number of NSW ED presentations per hour from 2010 to 2014 (green denoting smaller numbers and red denoting larger numbers).
Learnings from DESTINY

- It’s the older sick and injured patients
- It’s the young mentally ill
Lemmings from DESTINY

Research paper

Triage, damned triage... and statistics: Sorting out redundancy and duplication within an Emergency Department Presenting Problem Code Set to enhance research capacity

Saartje Berendsen Russell (BN, Med)\textsuperscript{a,b,*}, Michael M. Dinh (MBBS)\textsuperscript{a,c}, Nerida Bell (BN, MN Clin Ed)\textsuperscript{a}

\textsuperscript{a} Emergency Department, Royal Prince Alfred Hospital, Missenden Road, Camperdown, Sydney 2050, New South Wales, Australia
\textsuperscript{b} Faculty of Nursing, The University of Sydney, Mallett Street, Camperdown, Sydney 2050, New South Wales, Australia
\textsuperscript{c} Discipline of Emergency Medicine, The University of Sydney, Fisher Road, Sydney 2006, New South Wales, Australia

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\textbf{A B S T R A C T}

\textbf{Background:} Having a robust Emergency Department Presenting Problem Code Set (EDPPCS) is important for collecting and analysing data around Emergency Department (ED) activity, funding, bio-surveillance and research. This paper analyses the clinical utilisation of the current EDPPCS using two years worth of ED data collected as part of the larger state-wide Demand for Emergency Services Trends in Years 2010–2014 (DESTINY) project. This project proposes potential improvements in the current EDPPCS including a reduction in duplication and redundant clinical terms.

\textbf{Methods:} ED presenting problem fields were abstracted from the Emergency Department Data Collection (EDCC) Registry as entered by trained triage nurses. Frequencies of presenting problems were calculated and cross referenced with the EDPPCS. These were then categorised into clinically meaningful groups.

\textbf{Results:} There were 1,746,685 million eligible ED presentations during January 2013 and December 2014 to 23 level 5 or 6 EDs. Of these, there were 64,849 unique presenting problem entries with 450 terms being used more than 100 times during the study period. Of those 450 terms, only 177 (39.3\%) matched the current EDPPCS.

\textbf{Conclusion:} Future iterations of the EDPPCS should be based on the evidence presented making it shorter, more comprehensive and systematic leading to improved triage performance, usefulness in research and bio-surveillance.

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How can data analytics facilitate patient flow in ED?

LETS START
Patient flow

Triage → Stream → Initial assess

Review → Team “accepts” → Disposition

Bed located → Porters booked → Wait
The Sydney Triage to Admission Risk Tool (START) to predict Emergency Department Disposition: A derivation and internal validation study using retrospective statewide data from New South Wales, Australia

Michael M. Dinh$^{1,2,8*}$, Saartje Berendsen Russell$^{1,3}$, Kendall J. Bein$^{1}$, Kris Rogers$^{4}$, David Muscatello$^{5}$, Richard Paoloni$^{2}$, Jon Hayman$^{1,6}$, Dane R. Chalkley$^{1}$ and Rebecca Ivers$^{4,7}$

Abstract

**Background:** Disposition decisions are critical to the functioning of Emergency Departments. The objectives of the present study were to derive and internally validate a prediction model for inpatient admission from the Emergency Department to assist with triage, patient flow and clinical decision making.

**Methods:** This was a retrospective analysis of State-wide Emergency Department data in New South Wales, Australia. Adult patients (age ≥ 16 years) were included if they presented to a Level five or six (tertiary level) Emergency Department in New South Wales, Australia between 2013 and 2014. The outcome of interest was in-patient admission from the Emergency Department. This included all admissions to short stay and medical assessment units and being transferred out to another hospital. Analyses were performed using logistic regression. Discrimination was assessed using area under curve and derived risk scores were plotted to assess calibration.

**Results:** 1,721,294 presentations from twenty three Level five or six hospitals were analysed. Of these 49.38% were male and the mean (sd) age was 49.85 years (22.13). Level 6 hospitals accounted for 47.70% of cases and 40.74% of cases were classified as an in-patient admission based on their mode of separation. The final multivariable model including age, arrival by ambulance, triage category, previous admission and presenting problem had an AUC of 0.82 (95% CI 0.81, 0.82).

**Conclusion:** By deriving and internally validating a risk score model to predict the need for in-patient admission based
Prospective validation study

- Study of 900 patients at RPA and TCH followed through to discharge
- Final AUC 0.81
- Short stay/discharge prediction 0.84
# Calibration table

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Risk score range</th>
<th>Discharged N (%)</th>
<th>Admitted N (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Likely</td>
<td>&lt; 5</td>
<td>122 (96.06)</td>
<td>5 (3.94%)</td>
<td>127</td>
</tr>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td>5-10</td>
<td>193 (81.09)</td>
<td>45 (18.91%)</td>
<td>238</td>
</tr>
<tr>
<td>Discharge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate</td>
<td>11-15</td>
<td>140 (64.52)</td>
<td>77 (35.48%)</td>
<td>217</td>
</tr>
<tr>
<td>Likely</td>
<td>16-25</td>
<td>109 (38.65)</td>
<td>173 (61.35%)</td>
<td>282</td>
</tr>
<tr>
<td>Admission</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Likely</td>
<td>&gt; 25</td>
<td>5</td>
<td>25 (83.33%)</td>
<td>30</td>
</tr>
<tr>
<td>Admission</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Translation study – Can START improve patient flow in ED?

- Trial of START within SLHD
- START calculated at triage and communicated to senior ED clinicians to expedite decision making
- TRGS grant application $430,000 over two years
- Supported by ECI/ACI/The George Institute/SLHD
High Performance Computers

- Bayesian networks
- Decision trees
- Artificial neural networks
- Support Vector Machines
Artificial Intelligence and Patient Flow
Future Directions

- Clean up the EDDC!
- Linked dataset from EDDC and APDC
- HIE – vital signs, emeds, radiology reports
- ACI support and Clinical Data analytics framework
Future Directions

- Disposition
- Most appropriate admitting clinical service
- Consultations
- Length of stay
- Risk of representation
- Need for ICU