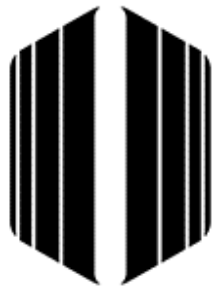


HPA

HEALTH POLICY ANALYSIS



IHPA

***Australian emergency care
classification development***

ABF/PCSI 2017 conference – Sydney, Australia

Authors and acknowledgements

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- Clinicians and hospitals participated in the costing study
- State and Territory health agencies
- IHPA

Context

- Current classifications URG/UDG
- The need for new classification identified in the *Investigative review of classification systems for emergency care 2014*
- Required for ABF funding, but also other uses

Drivers of cost in emergency care

- Potential cost drivers identified:
 - diagnoses
 - triage,
 - episode end status
 - Procedures
 - Investigations
 - Presenting problem
 - Additional diagnoses
 - Patient characteristics impacting resource use, termed 'diagnosis modifiers'

Diagnosis modifiers

- Unconsciousness
- Body mass index above 40
- Homelessness
- Involuntary mental health legal status
- Intellectual disability
- Severe mental health disorder
- Child at risk
- Chronic substance/alcohol dependence or abuse
- Patient unable to self-care
- Patient unable to communicate in English
- Patient distress/ confusion/ agitation requiring one to one nursing
- Patient is a residential care resident

Input

- Costing study :
 - Collect additional data to further explore cost drivers identified in the *Investigative review*
 - Obtain more accurate costs (not/less influenced by the classification variables)
 - 10 hospitals
- Consensus study on procedures

Methods

- Broad classification structure recommended by the Investigative Review
- Expert input
- Recursive partitioning for the complexity level of classification
- Performance assessment:
 - Root mean square error (RMSE).
 - Predictive R-squared.

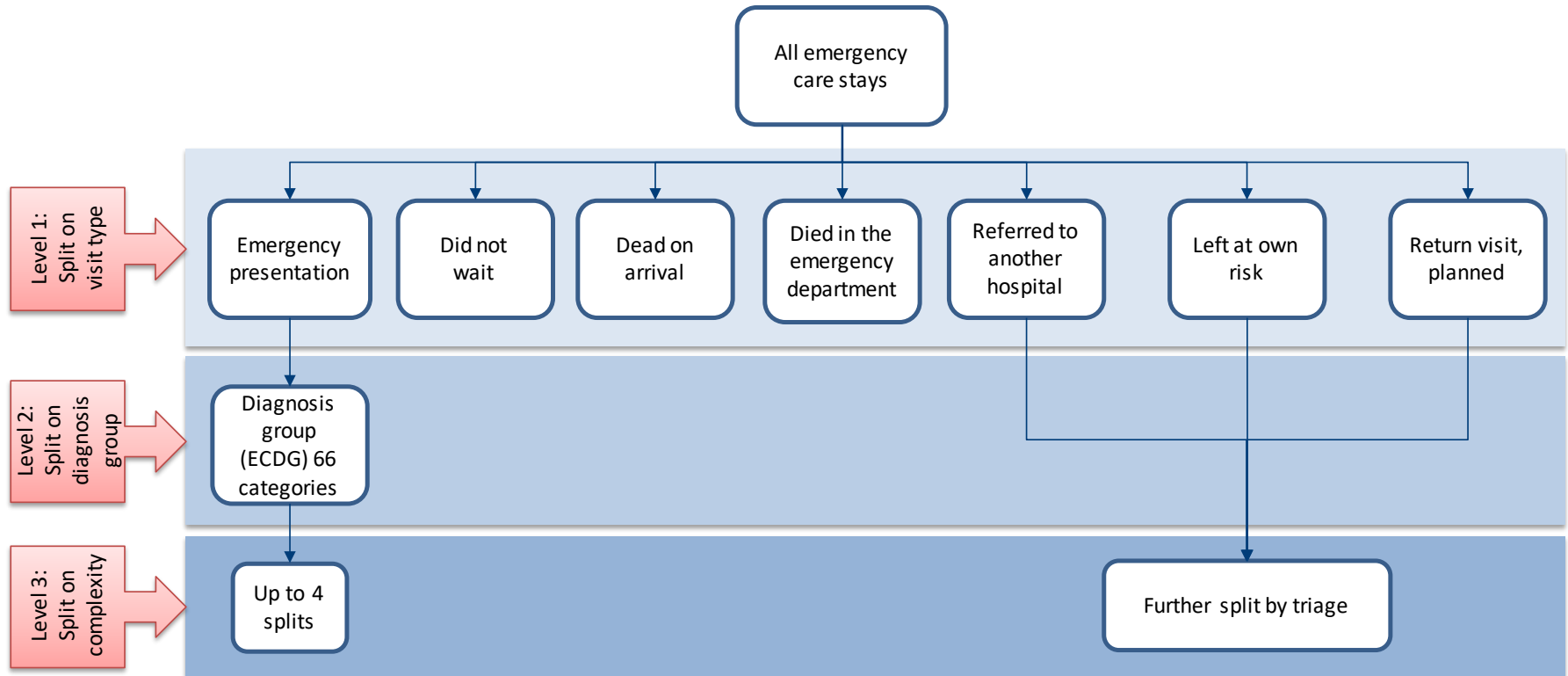
Initial analysis

- Initial analysis on individual candidate classification variables:
 - Singularly, emergency department diagnosis has the best predictive performance in terms of cost
 - Episode end status is the next best predictor
 - This is followed by triage and investigations, which have similar levels of predictive performance
 - Transport mode and age group also have reasonable predictive performance
- Presenting problem ruled out for further use

Results – draft classification

- Level 1: Emergency care (i.e. based on visit type)
Level 2: Clinically meaningful groups using emergency department diagnosis.
- Level 3: Split (where required) to reflect severity and/or complexity (consequently also reflecting resource use).

Results – draft classification



Level 3: Now:
Currently available
predictors

Level 3: Future:
New predictors

Results – draft classification

- Level 1: split on visit type:
 - emergency care
 - did not wait,
 - dead on arrival,
 - died in ED, transfer,
 - left at own risk
 - transfer

Results – draft classification

- Level 2: Emergency care diagnosis groups (ECDGs) – name to be confirmed
- Initial set developed by ED clinicians and HIM on the consortium
- Currently 66 groups

ECDG examples

Chest pain

- R07.1 Pain in chest on breathing
- R07.4 Pain in chest, other

Psychosis

- F20.9 Schizophrenia
- F22.9 Persistent delusional disorder and paranoia (except in schizophrenia)
- F239.0 Psychosis, acute, transient
- F25.9 Schizoaffective disorder, with or without psychotic episode
- F29 Psychosis, other

Arrhythmia and cardiac arrest

- I44.2 Atrioventricular block, complete
- I45.9 Conduction disorder (except complete atrioventricular block)
- I46.9 Cardiac arrest
- I47.1 Tachycardia, supraventricular
- I47.2 Tachycardia, ventricular
- I47.9 Tachycardia, paroxysmal other
- I48.9 Atrial fibrillation or atrial flutter
- I49.0 Ventricular fibrillation or flutter
- I49.5 Sick sinus syndrome
- I49.9 Cardiac arrhythmia, other
- R00.0 Tachycardia
- R00.1 Bradycardia
- R002 Palpitations

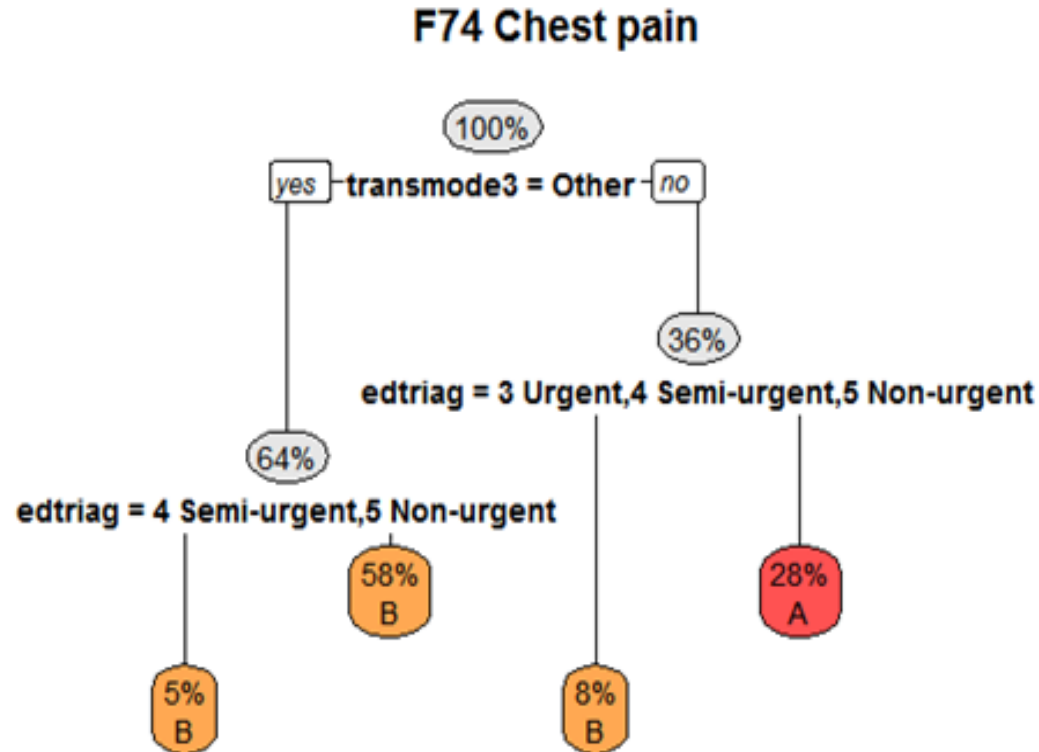
Results – draft classification

- Level 3: Complexity splits
- Introduced within ECDGs where relevant
- Initially developed based on variables available through routine data
- Future: Investigation, Procedures and Diagnosis modifiers

Level 3 – Modelling approach

- Recursive partitioning used to develop the complexity splits for the ECDGs
- Response: Cost
- Objective is to split the data into sub-groups within each ECDG, using specified predictor variables to identify the best set of sub-groups that predicts the value of cost.
- Results can be represented as a tree

Regression tree example I



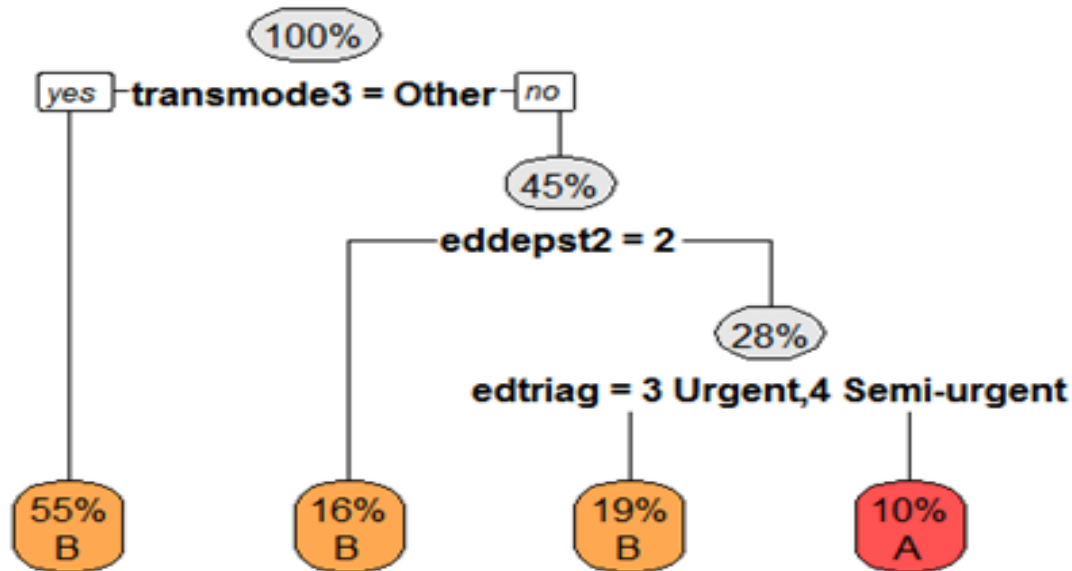
'Yes' and 'No' branches have only been labelled at the top level. Where a tree branches out further, 'Yes' is always to the left, and 'No' to the right.

Edtriag = Triage (urgency) category.

Transmode3 = Transport mode, where 1 = ambulance, air/helicopter, Other = all other.

Regression tree example 2

U62 Psychosis



'Yes' and 'No' branches have only been labelled at the top level. Where a tree branches out further, 'Yes' is always to the left, and 'No' to the right.

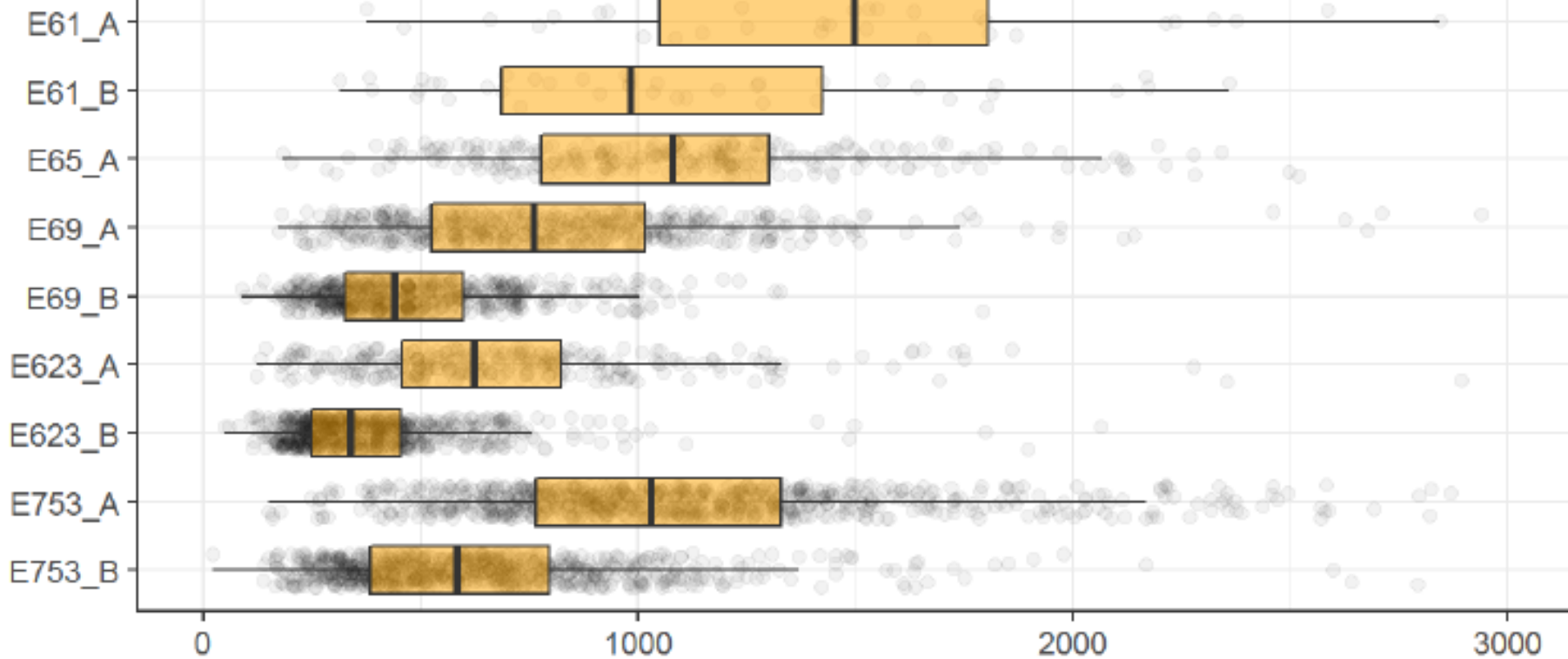
Edtriag = Triage (urgency) category.

Transmode3 = Transport mode, where 1 = ambulance, air/helicopter, Other = all other.

Eddepst2 = Episode end status, where 1_3_6 = admitted, referred to another hosp, died in ED, 2 = Departed, 5 = Left at own risk, Other = did not wait, dead on arrival.

| AECC end classes | Statistics from the <i>Emergency care costing study</i> | | | |
|--|---|-------------|---------------------------|----------------------------------|
| | n | Cost – mean | Cost – standard deviation | Cost – co-efficient of variation |
| E61 Major respiratory diagnosis | | | | |
| E61_A | 31 | \$1,490 | \$615 | 0.41 |
| E61_B | 41 | \$1,111 | \$554 | 0.5 |
| E623 Upper respiratory tract infection (URTI) | | | | |
| E623_A | 311 | \$691 | \$375 | 0.54 |
| E623_B | 715 | \$384 | \$204 | 0.53 |
| E65 Chronic obstructive airways disease | | | | |
| E65_A | 268 | \$1,140 | \$708 | 0.62 |
| E69 Asthma/ wheeze/ croup/ airway infection | | | | |
| E69_A | 536 | \$809 | \$388 | 0.48 |
| E69_B | 619 | \$484 | \$216 | 0.45 |
| E753 Respiratory disorder, other | | | | |
| E753_A | 831 | \$1,122 | \$531 | 0.47 |
| E753_B | 775 | \$638 | \$343 | 0.54 |

04 Diseases and disorders of the respiratory system



End classes

- Combination of splits (1,2,3,4) across the whole data will yield an appropriate number of end classes in the classification.
- Pruning of trees.
- Trade-offs between level 2 and level 3 of the classification
- Restricted number of end classes.
- Targets of 110, 120, 130, 140 and 150 end classes considered: Final draft 147

Predictive performance

- Performance assessed using predictive RMSE and R-squared statistics
- Cross-validation (i.e. partitioning of the training data and validation data) used to estimate these measures
- Aim to avoid over-fitting and over-learning
- Needed to ensure that the “feature” selection process included in this assessment

Conclusion

- The AECC de-emphasised triage and episode end status, but these currently remain with lower emphasis
- Provided greater utility for clinical and management processes by placing greater emphasis on diagnosis, and conditions that have a relatively common clinical pathway.

Next steps

- The draft classification will be subject to wide consultation.
- The classification and supporting components will be finalised
- Considerations for future versions of the AECC will be presented in the project Final report.