Australian emergency care costing and classification study

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Introduction and background

As part of the continuing development of activity based funding for Australian public hospitals, the Independent Hospital Pricing Authority (IHPA) commissioned a project – the *Australian emergency care costing and classification* (AECC) study – to develop a new patient-based classification system for emergency care provided by Australian hospitals. The project commenced in June 2015, and is planned to be completed at the end of 2017. It involves three major components: the conduct of a detailed costing study to investigate costs associated with emergency care (the *Emergency care costing study*); the development of a new patient-based classification system for emergency care; and specification for modifications and enhancements to emergency care data collections required to support the new classification. This paper will focus on the *Emergency care costing study*; other components of the AECC will be reported at future conferences.

Why a new emergency care classification is needed

Emergency departments are the frontline services of acute hospitals. In 2013-14 Australian public hospitals treated approximately 7.2 million patients presenting to emergency departments (Australian Institute of Health and Welfare 2014. *Australian hospital statistics 2013–14: emergency department care*. Canberra: AIHW). Since 2009-10, the number of public hospital emergency department presentations has increased by almost 5% annually.

Despite the vital role of emergency departments, classification and funding systems for emergency care are underdeveloped both in Australia and internationally. There is no well-established and universally recognised emergency care classification similar to Diagnosis Related Groups for acute inpatient services.

In 2013, IHPA commissioned work – the *Investigative review of classification systems for emergency care* (the 'Investigative review') – to review and recommend options for classifying and pricing public hospital emergency care. The report is available on the IHPA web site.

The Investigative review examined the literature on emergency care classifications from Australia and abroad, involved extensive stakeholder consultation, and analysed existing data sources. It identified strong support for a classification that was clinically meaningful and supported clinically useful analysis of emergency care according to patient mix.

This includes more prominence being given to complexity of treatment and increased use of clinical variables (that may potentially include presenting problem, diagnosis, investigations,

patient co-morbidities and dependency measures). It was recommended that IHPA support a staged development, of a classification(s) to replace the current interim classification systems i.e. Urgency Related Groups (URGs) and Urgency Disposition Groups (UDGs).

Overview of the *Emergency care costing study*

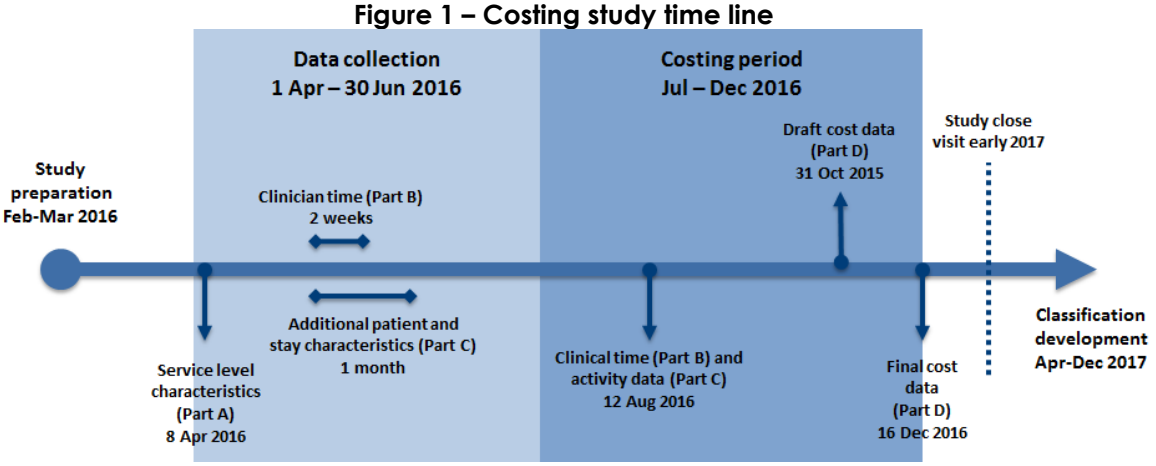
The *Emergency care costing study* is being conducted in a sample of emergency departments across Australia. States and territories were asked to nominate emergency care units to participate in the study. A feasibility assessment was undertaken of the nominated sites to ensure that they had the necessary infrastructure and skill base to execute the study, and also fit the sampling strategy. The final sample was made up of ten sites representative of the different sizes and roles of emergency departments, as shown in Table 1 below.

Table 1 – Participating sites

Emergency department type	Number of participating sites)
1. Specialist paediatric	1
2. Large ED – major cities	4
3. Large ED – regional	1
4. Other ED – major cities	1
5. Other ED – regional	2
6. Other ED – remote	1
Total sites	**10**

The time line for the *Emergency care costing study* is shown in Figure 1.

Figure 1 – Costing study time line



In addition to classification development, the *Emergency care costing study* has system-wide benefits for costing emergency care in the future, and additional benefits for participating hospitals.

The system-wide benefits include improved capacity to undertake higher quality costing into the future through: the availability of infrastructure to collect local data for the development of relative value units; closer scrutiny of the allocation of other costs to patients (such as non-clinical salaries and wages, goods and services); and methods to handle costing of areas considered difficult in the past, such as consultation and liaison services provided by emergency department clinicians to patients not currently in the emergency department.

For participating hospitals, the benefits include:

- Understanding cost drivers in the emergency department.

- Quantifying the impact of different models of care and service delivery options.
- Insights into the mix of cases and how this compares with other emergency departments.
- Capacity to compare costs with comparable emergency departments across Australia.

Data collection

Data collection for the *Emergency care costing study* has now been completed. The study collected the following types of data:

1. Patient and stay characteristics that are additional to those routinely collected.
2. Clinician time in relation to individual patients (including the activity/ procedure being undertaken).
3. Costed activity, using the clinician time collection information.

1. Additional patient and stay characteristics

Through the study more detailed patient and emergency stay characteristics than those available through routine national minimum data sets were collected over a four-week period, between 1 April and 30 June 2016. The Table below lists the patient/ stay characteristics requested for the study, and identifies those that were new for the purposes of this study.

Table 2 – Listing of patient/ stay characteristics required for the study

Type of data	Routinely collected	New
Presenting problem*	Yes	
Diagnosis*	Yes	
Additional diagnoses*	Yes	
Diagnosis modifiers**+		Yes
Procedures**		Yes
Investigations (Imaging and pathology)	Yes	

** Routinely collected by most sites; ** Routinely collected only by some sites; + See description below.*

Diagnosis 'modifiers' were defined as conditions or states that contribute to a patient being more complex than expected given their presenting condition, and are hypothesised to result in higher costs of care. They include factors that the Investigative review identified as potentially driving costs of patients. The list is as follows:

- Consciousness
- Body mass index flag (i.e. flag to indicate whether observed BMI is above 40)
- Homelessness
- 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

2. Clinician time

To aid the costing aspect of the study, information was also collected by sites on the time clinicians spend in providing care and treatment to individual patients, and in undertaking activities associated with patient care. Sites collected this data for a two-week period, which was within the four-week period during which the additional patient characteristics were

collected (see above). Sites implemented barcode scanning technology to collect this information, and some supplemented this with observers. These data will be used to develop relative value units for use in costing the four-week period, which is the next stage of the project.

A picture of the scanning device and a sample scan card are shown in Figure 2.

Figure 2 – Scanner and scan card example

Regional Procedures	
Abscess/collection aspiration or drainage	Nasal packing/cautery
Advanced patient cooling/ warming setup	Nasogastric/PEG tube insertion
Bandaging/Strapping sprained joint	Peritoneal Aspiration
Chest tube/catheter/thoracostomy	Peritoneal Dialysis
Eye irrigation	Plaster(POP)/backslab application
Foreign Body Removal	Pleural aspiration
Fracture/dislocation reduction	Rectal examination
Joint aspiration	Splint or sling application

3. Costed activity

Relative value units, based on the clinician time collected through the study, have been developed for study sites to undertake costing. Costing is for the entire 2015-16 financial year, involving the following:

- For patients in the study for which clinician time was recorded, clinician time will be allocated directly for costing.
- For patients in the study that had procedures and diagnosis modifiers recorded (but not clinician time), procedures will be used to allocate clinician time to patients (using clinician time collection to develop relative value units).
- For patients not in the study (i.e. outside the data collection period), the best available markers will be used to allocate costs. These may include treatment area, pathology/ imaging tests recorded for the patient, and other information available locally.

Project governance

Given the significance of the project to Australia, a robust governance process was established. This is shown in Figure 3. Key features are as follows:

- **Governance within the consortium, involving consortium partners and expert advisors** – Within the consortium, a Consortium Project Leadership Group (CPLG) manages the project. The CPLG is comprised of the consortium project director and project manager, and the members of the field management teams (FMTs). When appropriate, the expert advisors have also been involved.

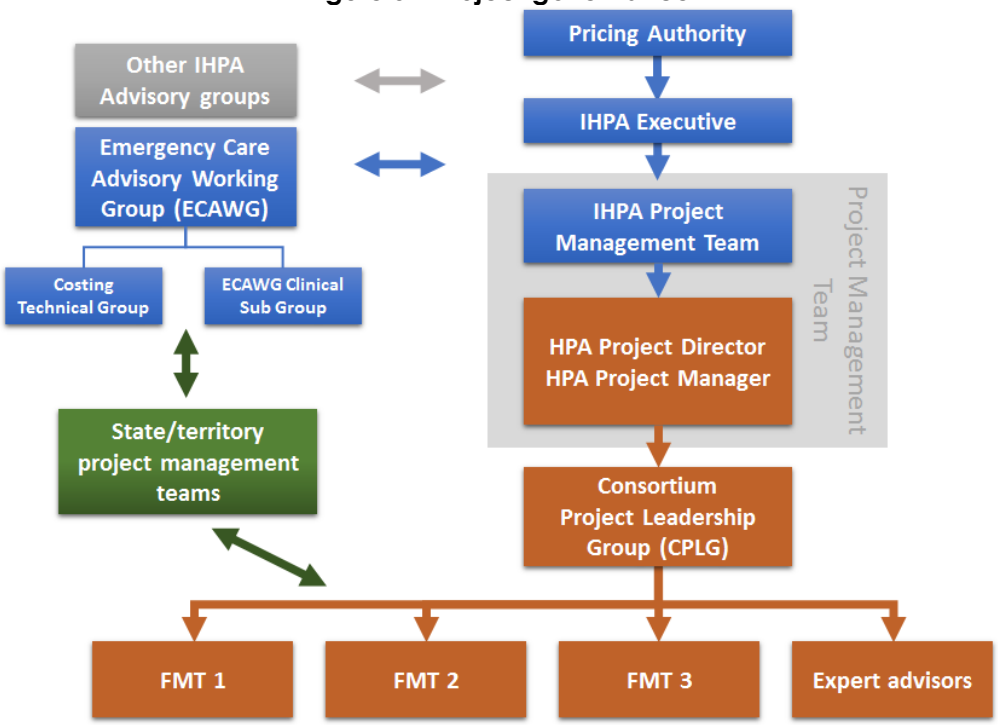
- **The interface between the consortium and IHPA** – The project management team consists of the IHPA project management team, the consortium project director, project manager, and project team member.

- **The interface between the consortium and the governance groups for this project established by IHPA, and other governance and advisory groups** – The Emergency

Care Advisory Working Group (ECAWG) is the reference group for the project. IHPA has also been providing regular updates of the project to the ECAWG Clinical Sub-Group, and sought the group's input on specific issues. The ECAWG Costing Technical Group was established specifically to oversee the costing component of the project. Further information on this group is provided below.

- **The interface between the consortium and the study sites** – Field management teams (FMTs) from the Health Policy Analysis consortium have supported sites throughout the study and collation of the data post the study.

Figure 3 – Project governance



Study support and infrastructure

IHPA provided financial support to participating sites to assist with project management costs (e.g. employment of a site co-ordinator). IHPA also supplied barcode scanning technology (hand held scanners and associated databases) to assist with data collection.

A set of documents were prepared to guide participating sites on various aspects of the study. These included the following:

- **Site implementation plan**, which provided guidance to participating sites on planning for and implementing the study.
- **Data request specification**, which set out the data to be provided by participating sites and the timeframes.
- **Costing methodology**, which provided guidance on the approach to costing emergency department stays by sites participating in the study.

Training materials were also developed and used by site co-ordinators to provide training for clinicians and other staff involved in the study.

A data management system was also developed for study sites. This system allowed sites to address data quality issues prior to submission, and generate data submissions that meet the specifications for the study. In producing data submissions, the system encrypts/de-identifies all patient and staff identifiers within the data, allowing de-identified data to be submitted.

Three FMTs across Australia supported the study sites. The FMTs worked closely with the sites and with the state and territory health authorities. They conducted a series of visits to sites during the study, to provide training, assist with site set-up, troubleshoot issues, and will formally close the study.

A study web site was established (www.edclassificationstudy.com) as a platform for all the study documentation, training materials and other information (e.g. frequently asked questions). The web site contains public pages with general information on the study and project, as well as restricted pages with information specifically for study sites and participants.

Pilot study

A pilot study was undertaken in an emergency department in a large Australian hospital, in November 2015. The objective was to test the feasibility of the design of the study, and the use of the data for the development of relative value units for costing emergency department care. Overall, the pilot was useful towards the wider study in a number of ways:

- It tested and confirmed the feasibility of the use of barcode scanning technology for the collection of clinician time for specific procedures and activities undertaken on patients.
- It tested the infrastructure associated with barcode scanning, namely the use of laminated scan cards, and the database into which the information from the scanners was downloaded and stored. Both of these underwent changes for implementation in the main data collection as a result of the learnings from the pilot.
- It tested and raised issues with the *Data request specification* developed for the study. The *Data request specification* was subsequently refined (in particular, the list of procedures to be collected through the barcode scanning was expanded to include activities and other procedures that were not previously included), and additional resources were developed (e.g. expanded definitions for procedures and activities, and a clinician guide to data collection).
- It tested and confirmed the feasibility of developing relative value units based on the data collected for the study.
- It identified enablers for the study (e.g. regularity of feedback of data scanned by clinicians as a means of motivating their continued participation, and support from the Emergency Department Director being critical for staff participation).
- It identified barriers to achieving comprehensive and quality data, such as adequacy of training.

Subsequently the hospital used the relative value units developed from the pilot study to cost the activity for the six months of the 2015-16 financial year. Feedback from the jurisdiction noted that the costing results achieved from the study relative value units were substantially different from those obtained using the existing relative value units, and that the costs based on the relative value units were validated by clinicians as being "in the right direction". The wider study will also test the differences between the study relative value units and existing relative value units used by jurisdictions in costing emergency care.

The Costing Technical Group (CTG)

The CTG was established as a sub-group of ECAWG to provide advice on the logistical and technical aspects of the costing methodology and process, specifically:

- advice on the costing methodology and costing issues raised by participating sites
- advice on the consistency in approach to data collection and costing practices
- advice on the development of the relative value units and cost results
- feedback on data samples and the final dataset
- feedback on the costing study report, as required.

So far the CTG met once in July, discussing the following:

- The methodology for costing planned for this project, and consideration of specific issues such as the need for virtual cost centres for specific cost items such as nurse practitioners and consultation and liaison services provided by emergency department clinicians to external patients (e.g. patients in other emergency departments).
- Approaches to developing relative value units.
- Outcomes of the pilot study.

The group is about to meet again in September 2016, to review the relative value units developed for each site based on the clinician times and additional patient conditions and characteristics collected. At the subsequent meeting in October 2016, members will discuss the outcomes of their application of the relative value units, and in November they will discuss the draft costing results using the relative value units prior to finalisation of the costing and submission of data for classification development.

Post data collection clinician survey

A survey of clinicians involved in the data collection was undertaken once the data collection activities concluded, to capture any further reflections that they may have about patient complexity following their participation in the study. The survey asked clinicians to draw on their clinical judgment, and experience of participating in the study, to assess whether the additional patient characteristics collected as part of the study added to complexity of care and/ or resource intensity of treatment. Clinicians were also encouraged to provide any other patient characteristic they believed impacted patient complexity and resource use.

This survey was distributed in June 2016 and closed in July 2016. 171 responses were received online and on paper. The number of responses by clinical designation are shown in Table 3.

Table 3 – Clinical designation of respondents

Designation	Responses
Nursing	97
Medical	66
Allied health	4
No designation listed	4
Total	**171**

The survey results confirmed that the diagnosis modifiers collected as part of the study were ones that clinicians believe have an impact on patient complexity and/ or resource use (and thus should be considered for the classification of emergency care in development). In the free text question, clinicians qualified that:

- Complexity increases with multiple diagnosis modifiers present in any one patient.
- Complexity increases when the emergency department clinicians attempt to resolve a patient's issues to send them home versus admitting them. This is contrary to the higher weights for subsequently admitted patients in the current URG classification,

and is a theme that has been consistent in the consultations with clinicians in relation to this project.
- The National Emergency Access Target (NEAT) target for 90% of patients to leave the emergency department within four hours of presentation also have an impact on how much resource goes into treating a patient. Additional resources go into treating patients that might not make the target.
- A patient that is a resident of an aged care facility may sometimes lead to decreased resource use, as it makes discharge easier.

Additional conditions or other characteristics impacting on patient complexity and/ or resource use (i.e. in addition to those already collected through the study) identified by clinicians were as follows:

- Age less than 1 year or 75 years plus.
- Patients on more than three medications.
- Aboriginal and/ or Torres Strait Islander status.
- Arrival by ambulance.
- Lack of mobility.
- Low compliance with treatment/ refusal of care.
- Patients travelling long distances for treatment.
- At risk of falls.
- Domestic violence/ sexual assault.

Clinicians also listed a range of specific diagnoses that are likely to be high complexity and/ or cost, which can be statistically tested in the classification phase of the project.

Consensus study of clinician's time in undertaking emergency department activities and procedures

In addition to the above, a consensus study was undertaken to obtain clinician estimation of the time required to undertake procedures and activities typical in emergency department settings. The study included estimation by medical, nursing and individual allied health disciplines. The result of the consensus study will be used to validate the times captured through the empirical study, and potentially also to address gaps where they exist.

As is the nature of consensus studies, two rounds of data collection were undertaken. Table 4 shows the number of respondents in the first round, and the numbers nominating in the second round. Only a small number of respondents from the initial round of the survey had nominated to be involved in the second round. This was complicated by the fact that some categories already had low responses in the first round. These figures are shown in the Table below.

Table 4 – Consensus survey responses – number of respondents in the first round, and number nominating to be involved in the second round

Those nominating for the second round are shown in brackets within each designation

Medical	Nursing	Allied health
Doctor designation: Registrar – 4 (1) Career medical officer – 2 (0) Specialist consultant – 126 (22)	*Nurse designation:* Clinical nurse specialist – 12 (5) Clinical nurse consultant – 4 (4) Clinical nurse educator – 9 (6) Clinical nurse manager – 6 (4) Other registered nurse – 33 (18) Nurse practitioner – 4 (2) Enrolled/ Endorsed enrolled – 1 (0)	*Discipline:* Clinical pharmacy – 6 (4) Dietetics – 2 (0) Occupational therapy – 23 (18) Orthotics and prosthetics – 2 (2) Physiotherapy – 32 (22) Social work – 10 (6) Speech pathology – 11 (6) Other allied health – 5 (5)
Total: 132 (23)	**Total: 69 (39)**	**Total: 91 (63)**

Where the number of respondents with specific designations was low in the first round of the survey, it was not deemed sensible to survey the respondents in the second round. This was the case for example for many of the allied health disciplines. Therefore, the number of surveys distributed in the second round were as follows:

- Occupational therapists – 18 (the summary results of the occupational therapists only were presented).
- Physiotherapists – 22 (the summary results of the physiotherapists only were presented).
- Specialist consultants – medical – 22 (the summary results of the specialist consultants only were presented).
- Nurses – 37 (the summary results of the registered nurses, clinical nurse consultants, educators and specialists were combined and presented to all except for nurse practitioners and enrolled/ endorsed nurses).

The numbers of responses received in the second round were as follows:

- 8 out of 18 occupational therapists
- 11 out of 22 physiotherapists
- 5 out of 22 specialist consultants - medical
- 8 out of 37 nurses.

The results from the second round of the consensus survey have now been analysed. These are being presented, in conjunction with the first round results, to the national emergency medicine and nursing colleges and national allied health groups for comment. These groups will provide the final validation of the results prior to their comparison with the times obtained from the empirical study, and their potential use in the development of relative value units for costing.

Continuous quality improvement

As part of the project governance process, a *Quality assurance plan* was developed that set out the mechanisms via which processes/ outcomes will be assessed for the project.

The purpose of the plan is to ensure that mechanisms are in place to produce quality outputs, and also to allow opportunities to correct any parts of the process that may not be contributing optimally to the desired outcomes of the project. In addition, it provides an opportunity for the key parties involved in the project (i.e. IHPA, participating sites and state/ territory health authorities, ECAWG members and the consortium) to learn from the project and apply these learnings in the further execution of the project, and other similar projects.

IHPA and the state and territory health authorities are being surveyed three times during the life of the study, with one survey already completed. The results of the first survey were that IHPA and the states and territories agreed or strongly agreed that: they were informed of key issues in a timely manner; that the materials produced for the study were clear; that they had ample opportunities to provide feedback; that the consultants were open to feedback; and that the feedback was incorporated into the study design and/or project documentation effectively.

A post data collection survey was also developed for site co-ordinators. It was intended to help the consortium and IHPA understand the challenges faced by sites in implementing the study, provide context for the results obtained by each site, and also assist with the design and implementation of similar studies in the future.

The survey asked site co-ordinators to provide quantitative ratings relating to study set up, engagement and preparation. It covered aspects such as set up processes, training, study documentation, infrastructure (including the useability of the website and study site data management systems), and support internally and from the FMT. The survey also offered site

co-ordinators the opportunity to provide free text feedback to articulate specific issues they encountered and suggest amendment for future studies. Site co-ordinators:

- Agreed that the study site set up visit achieved the purposes that it set out to achieve (e.g. understanding of the time frames for data collection and data submission; understanding of the additional data items to be collected for the study; identifying the most suitable approach to collecting clinician time; and understanding of how to use the barcode scanners).
- Found the study resources and infrastructure helpful.
- Agreed that the technology used for the collection (scanners, the barcode scanning database and the Health Policy Analysis study site data management system) was straightforward and intuitive to use.
- Strongly agreed that they had support for the study from IHPA, the FMTs and the barcode scanning vendor. Within this, they agreed that the support was timely, but were neutral about the usefulness of the site co-ordinator teleconferences.

Quality will continue to be monitored during the remainder of the costing study and the classification development phase.

Lessons learned

The lessons learned so far from this study so far include:

- Barcode scanning is a feasible mechanism for collecting good quality data for costing purposes.
- Barcode scanning is acceptable to clinicians for a focussed, time-limited study, however, observers are required in some circumstances (e.g. resuscitation area).
- Scan cards cannot be extensive, as they need to be carried around by staff.
- Daily progress reporting provides incentives for continued best efforts of clinicians in recording data, and improved data quality.
- Flexibility is required in data collection, e.g. the ability to scan more than one activity/procedure in a single time session due to the inability to clearly differentiate time between them.
- Mechanisms are required to extrapolate the information collected over the limited time period to the costing period.
- Support of senior clinicians is crucial in the conduct of this type of work.

Conclusion and next steps

The results of the costing study will allow investigation of patient and stay characteristics that lead to cost differences between patients, and consequently provide the basis for classification development. The classification development will be undertaken in 2017.

In addition to developing a classification system, the study has other benefits, such establishing an improved capacity by sites to undertake higher quality costing on an ongoing basis.