

Independent Hospital Pricing Authority

# Development of the Australian Teaching and Training Classification

Public consultation

Version 0.1, August 2017



IHPA

## Version history

Version	Effective Dates	Change Summary
0.1	August 2017	Final version of ATTC public consultation document

## Development of the Australian Teaching and Training Classification – public consultation paper, version 0.1, August 2017

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# Acronyms

<b>ABF</b>	Activity Based Funding
<b>AHPCS</b>	Australian Hospital Patient Costing Standards
<b>ATTC</b>	Australian Teaching and Training Classification
<b>COAG</b>	Council of Australian Governments
<b>CV</b>	Coefficient of Variation
<b>DSS</b>	Data Set Specification
<b>FTE</b>	Full-Time Equivalent
<b>HTTA</b>	Hospital Teaching and Training Activities
<b>HTTRA</b>	Hospital Teaching, Training and Research Activities
<b>IHPA</b>	Independent Hospital Pricing Authority
<b>METeOR</b>	Metadata Online Registry
<b>NBEDS</b>	National Best Endeavours Data Set
<b>NEP</b>	National Efficient Price
<b>NHCDC</b>	National Health Cost Data Collection
<b>NHRA</b>	National Health Reform Agreement
<b>NMDS</b>	National Minimum Data Set
<b>PGY1</b>	Postgraduate Year 1
<b>PGY2</b>	Postgraduate Year 2
<b>PGY3+</b>	Postgraduate Year 3 and above
<b>TTR</b>	Teaching, Training and Research
<b>TTRWG</b>	Teaching, Training and Research Working Group

# Executive summary

The Independent Hospital Pricing Authority (IHPA) is an independent government agency established by the Commonwealth as part of the implementation of the National Health Reform Agreement 2011 (NHRA). The NHRA requires that IHPA, amongst other functions, develop and specify the classifications for services provided by public hospitals to be funded under an Activity Based Funding (ABF) arrangement. IHPA undertakes reviews and updates of existing classifications and is also responsible for introducing new classifications.

Teaching, training and research (TTR) activities represent an important role of the public hospital system alongside the provision of care to patients. However, there is currently no classification system for TTR, nor are there mature, nationally consistent data collections for activity or cost data which would allow IHPA to price TTR using ABF methods.

A proportion of teaching and training activities in public hospitals are currently funded through block funding or grants. The development of an Australian Teaching and Training Classification (ATTC) will enable such activities to be funded on an ABF basis in the future in order to increase the transparency of funding flows from governments to hospitals. A teaching and training classification will provide better management, measurement and funding of high quality and efficient teaching and training activities.

In December 2014, IHPA provided advice to the Council of Australian Governments (COAG) Health Council that it is feasible to transition funding for teaching and training activities from block funding and grants to ABF arrangements. Subsequently, IHPA has undertaken a significant program of work to inform the development of the first iteration of the ATTC.

This public consultation paper seeks stakeholders' views on the classification's proposed structure and data items for inclusion. The consultation paper describes the work undertaken to date to design a nationally consistent method of classifying teaching and training activities and the associated costs, provides details of the statistical data analysis undertaken and consultation processes used.

The development of the ATTC builds on a significant program of work to develop an ABF framework for teaching and training. In 2013, IHPA developed a set of nationally agreed definitions for teaching and training and research. The Definitions and Cost Drivers project also identified and analysed cost drivers for teaching and training, providing a framework for the development of a classification for teaching and training.

In 2013, IHPA established the first national ABF data collection for teaching and training through the development of the Hospital Teaching and Training Activities Data Set Specification (HTTA DSS). The HTTA DSS specified the data that states and territories needed to report to IHPA on an ongoing basis to support the development and implementation of a classification for TTR. Data collection on a best endeavours basis for national teaching and training activity data commenced from 1 July 2014.

In 2015, IHPA undertook a six-month costing study at 19 public hospitals in three jurisdictions across Australia. The overall finding of the TTR Costing Study was that while the data provided an adequate starting point for the development of a teaching and training classification, there was a low degree of confidence in the research data obtained. Therefore at this stage IHPA does not intend to undertake work in developing a research classification system.

The structure of the ATTC has been based on the detailed findings from the TTR Costing Study, which compared the relative costs to conduct teaching and training across both the professional group (e.g. allied health, medicine etc), and stage of training (e.g. student, new graduate or advanced trainee). Unlike the other streams currently funded through ABF where activity is a patient episode of care, the ATTC 'activity' unit is a trainee.

The development of the ATTC is in the interests of all Australian governments, public hospital health service providers and ultimately the professionals delivering and receiving teaching and training. It will provide more accurate and consistent data about the teaching and training provided across all public hospital service settings.

As with other classification systems, development of the ATTC is an iterative process. The initial version to be implemented will not specify all professional specialties, as data to support further classification development will need to be collected over coming years.

Pricing of teaching and training activities is a separate matter. IHPA consults on approaches to pricing public hospital services through its annual consultation on the Pricing Framework for Australian Public Hospital Services. Following development of the ATTC and the availability of activity and cost data through the ongoing ABF data collection, IHPA will seek views on a pricing approach.

## Acknowledgments

Thank you to members of the Teaching, Training and Research Working Group (TTRWG) for their advice and support and to the numerous health professionals involved in the targeted consultation process to develop the ATTC Version 1.0. Thank you to PricewaterhouseCoopers for their statistical analysis and modelling which informed the structural options and end classes for the ATTC Version 1.0. Thank you to the over 400 stakeholders that provided input into the extensive consultation process as part of the Definitions and Cost Drivers project, and the staff and management from the 19 hospital sites that participated in the TTR Costing Study.

## Submissions

Submissions should be sent as an accessible Word document to [submissions.ihsa@ihsa.gov.au](mailto:submissions.ihsa@ihsa.gov.au) or posted to “Submissions” PO BOX 483 Darlinghurst NSW 1300. **Submissions close at 5pm (AEST) Friday 29 September 2017.**

## More information

The [IHPA website](http://www.ihsa.gov.au) provides up to date information on the development of the ATTC, including links to key documents referred to in this public consultation paper: [www.ihsa.gov.au](http://www.ihsa.gov.au).

This document assumes some knowledge of classification development. IHPA recognises the importance of a broader audience engaging in this consultation process. Should your organisation require further resources to assist in explaining the classification development process, please contact IHPA at [enquiries.ihsa@health.gov.au](mailto:enquiries.ihsa@health.gov.au).

# Summary of Consultation questions

IHPA is seeking written comments on the following areas:

1. Are the current variables included in the ATTC Version 1.0 relevant to clinicians, health service managers, and other stakeholders?
2. Are there any further considerations in relation to the proposed structure?
3. Are there other variables which should be considered in future versions of the ATTC?
4. What supporting material would be beneficial for the ATTC?
5. What communication avenues and methods should IHPA consider in order to inform and engage stakeholders of the ATTC and future ABF for teaching and training?
6. Are there particular aspects or areas of the ATTC that should be prioritised in its development, or aspects that should be developed at a later stage?
7. Are there any further considerations that should be taken into account when developing the ATTC?

# 1. Context

## IHPA

IHPA is an independent government agency established by the Commonwealth as part of the implementation of the NHRA. The NHRA requires that IHPA provide advice to the COAG Health Council on the feasibility of transitioning funding for TTR to ABF or other appropriate arrangements reflecting the volumes of activities carried out under these functions by no later than 30 June 2018.

IHPA is governed by the Pricing Authority. Members of the Pricing Authority bring significant expertise and skills to the role, including substantial experience and knowledge of the health care needs and the provision of health care services for people living in regional and rural areas.

IHPA has a number of determinative functions as specified by the NHRA. IHPA's primary role is to determine the National Efficient Price (NEP) and the National Efficient Cost for public hospital services. Other functions IHPA has responsibility for include determining data requirements, and developing and specifying the classifications for services provided by public hospitals. IHPA undertakes reviews and updates of existing classifications and is also responsible for introducing new classifications.

## Classification systems

Classification systems aim to provide the health care sector with a nationally consistent method of classifying patient level activity and other services, and their associated costs in order to provide better management, measurement and funding of high quality and efficient health care services.

Classifications are comprised of end classes (codes) that provide clinically meaningful ways of relating the types of hospital activities (such as patient care and teaching and training) to the resources required. They enable hospital and health service provider performance to be measured by creating a link between hospital activities and the resources consumed for undertaking these activities. Nationally adopted classifications for services provided in public hospitals allow Australian governments to provide funding to public hospitals based on the ABF mechanism.

## Current status of funding of TTR activities provided in public hospitals in Australia

Much of the teaching and training delivered to health professionals and students in public hospitals occurs through the delivery of patient care (known as embedded teaching and training). Patient care services including admitted acute care, admitted subacute and non-acute care, emergency care, non-admitted care and mental health care are already funded through ABF, with the cost of providing embedded teaching and training included within the ABF price. However, some teaching and training activities are currently funded through block funding or

grants. There is little visibility as to the teaching and training activity provided and where block funding or grants are allocated at a state and territory or Local Hospital Network level. The development of the ATTC will enable teaching and training activities in public hospitals currently receiving block funding, to be funded on an ABF basis in the future which increases the transparency of funding flows from governments to hospitals.

## **Benefits of the ATTC**

A relevant and current classification system will assist health services to use the new ATTC system in a number of ways, including:

- Assist with the administrative management of teaching and training in hospitals and health care services
- Improve statistical reporting
- Enable quality improvement initiatives, such as benchmarking and performance measurement across similar services, and
- Provide the health care sector with a nationally consistent method of classifying teaching and training activities and costs to ensure transparent and efficient funding of these activities.

The ATTC will provide the health sector with a nationally consistent method of classifying teaching and training activities and associated costs which allow public hospital outputs to be measured, which forms the crucial data for policies on funding, budgeting and setting costs.

## **Stakeholder engagement in the TTR Work Program**

IHPA's TTRWG was established in 2013 to develop and advise on a work program on approaches to the classification and costing of TTR activities undertaken within public hospitals. The TTRWG is responsible for overseeing the development of the ATTC and has a large and broad membership including: jurisdictional representatives from state, territory and Commonwealth health departments; professional bodies; higher education (including those representing rural interests) and research institutions. Current membership includes:

- State and territory health departments
- Commonwealth Department of Health
- Allied Health Professions Australia
- Association of Australian Medical Research Institute
- Australian College of Nursing
- Australian Council of Pro Vice-Chancellors and Deans of Health Science
- Australian Medical Association
- Australian Medical Association Doctor in Training
- Australian Private Hospitals Association
- Australian Rural Health Education Network
- Catholic Health Australia
- Clinical Trials Action Group
- Committee of Presidents of Medical Colleges
- Confederation of Postgraduate Medical Councils

- Council of Deans of Nursing and Midwifery
- Federation of Rural Australian Medical Educators
- Medical Deans Australia and New Zealand
- National Health and Medical Research Council
- TAFE Directors Australia
- Universities Australia

IHPA has worked with the TTRWG and other IHPA advisory committees such as the Clinical Advisory Committee to develop the ATTC. IHPA is also committed to continuing to engage the sector through additional targeted and public consultation processes.

## 2. Work undertaken to date

This section describes the work undertaken by IHPA to build the foundations for developing the ATTC, starting with the development of nationally consistent definitions of TTR for ABF purposes, the establishment of a national ABF data collection for TTR activities and a costing study to inform the development of a classification.

### Definitions and cost drivers project

In June 2013 IHPA initiated a project to define TTR and identify associated cost drivers for ABF purposes.

#### Definitions

The [Definitions and Cost Drivers project](#) established nationally consistent and broadly accepted definitions for TTR. The TTR definitions were developed to take into account the scope outlined by the NHRA, and were agreed following an extensive consultation process with over 400 stakeholders from health services, jurisdictional health departments, peak bodies, interest groups and clinicians.

The definitions of ‘teaching and training’ and ‘research’ for ABF purposes were approved by the Pricing Authority in February 2014.

#### **Teaching and training describes:**

*“The activities provided by or on behalf of a public health service to facilitate the acquisition of knowledge, or development of skills. These activities must be required for an individual to:*

- *attain the necessary qualifications or recognised professional body registration to practice;*
- *acquire sufficient clinical competence upon entering the workforce; or*
- *undertake specialist/advanced practice*

*in Medicine, Dentistry, Nursing, Midwifery or Allied Health.”*

#### **Research describes:**

*“The activities undertaken in a public health service where the primary objective is the advancement of knowledge that ultimately aims to improve consumer and patient health outcomes and/or health system performance. The activity must be undertaken in a structured and ethical way, be formally approved by a research governance or ethics body, and have potential for application outside of the health service in which the activity is undertaken.*

*For ABF purposes, the definition of research relates to:*

*the public health service's contribution to maintain research capability, excluding the costs of research activities that are funded from a source other than the State or Territory or provided in kind."*

## **Cost drivers and recommended classification structure**

The Definitions and Cost Drivers project conducted a detailed environmental scan which noted the wider responsibility public health services have to deliver non-clinical training activities as part of good practice in maintaining a high-performing, safe workplace. The environmental scan identified a boundary around the nature of teaching and training for ABF purposes, specifically activities that are prerequisites for achieving a qualification or registration to practice in the clinical professions. It was acknowledged that the funds to support these endeavours already exist in funding pools; hence not all teaching and training activities were intended to be in scope for ABF purposes. Funding for non-clinical training activities remains sourced from existing alternate funding pools.

The Definitions and Cost Drivers project defined key teaching and training activities such as direct, indirect, embedded and overhead activities and costs, providing the scope for the TTR Costing Study. It identified a range of potential cost drivers for TTR activities and provided a framework for developing the new classification.

The feasibility of capturing direct and indirect teaching and training activities received broad support. However, it was unable to establish whether the embedded component of teaching and training could be separately identified. This was further investigated in the TTR Costing Study.

## **Classification framework for teaching and training**

A key recommendation from the Definitions and Cost Drivers project was that the scope of a future classification for teaching and training should be defined by two primary criteria:

1. The professional group in which a trainee is employed (or placed), and
2. The stage of teaching and training in which the individual is engaged.

Following the Definitions and Cost Drivers project, in December 2014, IHPA provided advice to the COAG Health Council that it was feasible to fund teaching and training on an activity basis. IHPA advised that further work needed to be done on research to determine its feasibility to be funded on an activity basis.

## **The commencement of national data collection for teaching and training**

National data collections are essential to the development of classifications and the implementation of ABF. IHPA develops Data Set Specifications (DSS), more recently termed National Best Endeavours Data Sets (NBEDS), to describe metadata sets that are not mandated for national collection, but where there is a commitment to provide data nationally on a best endeavours basis. DSS and NBEDS contain a set of data items to be collected in combination with an agreed set of instructions, definitions and output values.

In keeping with the data principle 'single provision, multiple use', the DSS and more recent NBEDS for TTR were derived from several existing data sources which could be reported by states and territories. Findings from the environmental scan conducted as part of the Definitions and Cost Drivers project aided understanding of data items that were available and feasible to collect. Data items for inclusions were informed by a number of existing health data collections at the time such as jurisdictional teaching and training data sets, Health Workforce Australia's Clinical Placements Dataset, and the Australian Bureau of Statistics. A range of issues were considered including data availability, burden of collection, and directness of association with TTR activity.

Experience from other classifications confirms that reliable and robust national data collection requires time and investment for infrastructure and processes to be embedded and for definitions to become understood and more consistently applied. Therefore, IHPA commenced the development of the Hospital Teaching and Training Activities Data Set Specification (HTTA DSS) in June 2013. In July 2014, data collection of national teaching and training activity data using the HTTA DSS 2014-15 commenced on a best endeavours basis prior to implementation of the ATTC to provide states and territories with ample time to identify potential issues with the data set.

In 2015-16, the HTTA DSS was revised to include new data elements to capture research activity, and in 2016, the name of the DSS was revised to the Hospital Teaching, Training and Research Activities National Best Endeavours Data Set (HTTRA NBEDS) following the decision by the National Health Information Standards and Statistics Committee to rename all DSS as NBEDS. HTTRA data for activity based funding has been collected for two years, with the most recent 2015-16 submission comprising of teaching and training data from three jurisdictions, and research data from one jurisdiction.

The HTTRA NBEDS is registered on the Australian Institute of Health and Welfare's Metadata Online Registry (METeOR) as an IHPA standard data set specification.

IHPA recognises that multiple sources may be required to collect this data, including educational institutions, and encourages jurisdictions to work together with these sources.

## **TTR Costing Study**

In 2015, IHPA conducted a TTR cost and activity data collection at a representative sample of Australian hospitals, in order to develop a costed data file to inform the development of a TTR classification.

The [TTR Costing Study](#) collected a broad array of TTR data. All jurisdictions were requested to participate, of which three jurisdictions agreed and nominated 19 sites across Australia: Queensland (13 sites), Western Australia (5 sites), and South Australia (one site). A list of the hospitals that participated in the TTR Costing Study is at Appendix A.

The TTR Costing Study included a six-month prospective data collection period from May to October 2015. Additionally, the TTR Costing Study collected retrospective teaching, training and research data from January to April 2015 where it was available.

One of the principal outcomes outlined in the TTR Costing Study final report was that the available data provides an adequate starting point for the development of a teaching and training classification. The report also noted the limited quantity and quality of research activity and cost data collected in the TTR Costing study provided a low degree of confidence that the results relating to research capability are adequately representative to define a state and territory funded research classification system.

## TTR Costing Study data set

The final TTR Costing Study data set contained fields that provided information about:

1. The hospital and data collection (for example, site name, geographic region, month of collection)
2. The individuals who received training (for example, their profession, the type of trainee, specialty or medical college)
3. The counts and costs of providing training to these individuals (for example, headcount, full time equivalent [FTE] count, direct and indirect costs, overheads).

The TTR Costing Study provided a rich data set which captured costs related to the following types of teaching and training related activities:

1. **Direct activities:** Distinct and separable activities which occur outside of an episode of care but are directed towards skills and knowledge development. In the teaching and training context, direct activities include, for example, lectures, tutorials and workshops.
2. **Indirect activities:** Administrative and coordination activities undertaken by a health service that are essential to facilitate teaching and training. These activities may include utilities, maintenance, the coordination of student placements, rotations, educational program development or negotiation with higher education providers.
3. **Embedded activities:** Where teaching and training occurs in conjunction with patient care. This includes activities such as ward rounds, training during surgical interventions or refinement of other procedural skills such as cannulisation or catheterisation.
4. **Overheads:** A hospital's corporate overhead costs (e.g. finance department and payroll services).

TTR Costing Study sites were able to provide data related to direct and indirect teaching and training activities on a consistent basis across most professions, although there was variation in the scope and breadth of professions and trainee types between the different sites. Embedded teaching and training costs were modelled using information on clinician time obtained from a clinician and trainee survey.

The final TTR Costing Study data set contained 10,446 records, with each record reporting the costs and counts of trainees for each possible combination of site, profession, trainee type, stage, specialty, medical college and procedural specialty indicator. That is, each participating hospital had multiple rows of data if it had trainees across multiple professions and trainee types, with each record showing the total number of trainees, FTE trainees and cost breakdowns as per the categories of direct, indirect, embedded and overheads.

# 3. Development of the ATTC Version 1.0

This section describes the work undertaken to develop ATTC Version 1.0 including the decisions made during the data set preparation stage in order to have a robust data set that was fit for purpose, data limitations, findings from exploratory analysis and the modelling methodology used.

## Classification development decisions

### Unit of activity

The unit of activity that is being classified for teaching and training is not a patient episode of care but a trainee. To measure trainee activity, IHPA has adopted FTE as the unit to be classified in developing the ATTC, as opposed to trainee headcount, in line with the recommendation from the Definitions and Cost Drivers project. This recommendation was based on the fact that employed trainees, which form the bulk of the trainee groups, are described as staff FTE in most jurisdictional data systems, and student placement data, which is commonly reported in terms of placement hours or days, can be easily converted to an FTE measure. The specifications for the classification are reported through the associated data collection.

### Exclusion of embedded costs

Findings from the TTR Costing Study indicated that based on the data collected during the study, for most professional groups embedded teaching and training costs represented nearly 80 percent of total teaching and training costs.

However, embedded costs were excluded from the exploratory data analysis and classification data modelling for the development of the ATTC for a number of reasons.

Embedded teaching and training costs are already priced as part of the other ABF models (acute, subacute and so forth). Hospitals undertake patient level costing and report all costs associated with patient care in the National Hospital Cost Data Collection. Therefore, teaching and training provided in operating theatres, for example, is currently priced under the admitted acute care ABF model using Diagnosis Related Groups.

In addition, the nature of embedded teaching and training activity means it occurs during the delivery of patient care. It is extremely difficult to delineate embedded teaching and training costs from regular clinical service delivery costs and it would be administratively burdensome for clinicians and hospitals to collect this data in order to remove embedded teaching and training costs from patient care costs on a consistent basis, either now or in the future.

The TTR Costing Study used a clinician survey method to collect embedded teaching and training activity data in order to attempt to model embedded teaching and training costs. The method used to record and model embedded costs introduces uncertainty regarding robustness of the data which was collected through a very small number of clinician and trainee survey responses. It is also not a practical method for ongoing data collection.

As such, the ATTC was developed using only direct and indirect costs, i.e. costs in scope under the current block funding arrangements. Although, at face value, the removal of embedded costs from the development of the ATTC excludes a significant proportion of teaching and training costs, the development of a classification structure requires the identification of splitting variables for teaching and training activities with distinguishable costs and is concerned with the relativities between costs rather than the actual costs themselves.

Pricing teaching and training activities for ABF purposes will occur at a later date, and is a separate process to classification development. This is discussed further at page 29.

### Exclusion of overhead costs

Overhead costs were excluded from the exploratory data analysis and classification data modelling as the TTR Costing Study collected overhead costs related to teaching, training *and research* activities in aggregate, and as such the amount of overheads allocated to teaching and training was only an approximation. The allocation of overhead costs for teaching and training is being considered in Version 4 of the National Hospital Cost Data Collection Australian Hospital Patient Costing Standards (NHCDC AHPCS).

### Data limitations

The extensive data collected from the TTR Costing Study has provided a detailed description of the nature of teaching and training activities and costs. This data was determined to be sufficient for classification development.

However, there were some limitations to the TTR Costing Study data set, as noted in the TTR Costing Study final report. These include:

1. **Data timing and seasonality:** Data for the TTR Costing Study was collected from May to October 2015. The collection window may mean that the average costs for TTR were impacted by seasonality. The TTR Costing Study final report confirmed that teaching and training activity is impacted by seasonal influences. For example, the commencement of first term for new medical registrars generally commences at the end of January, and data from some sites indicated higher levels of direct medical teaching and training activities delivered in February to May compared to other months. Additional data from retrospective collection was captured from nine hospitals in the TTR Costing Study to try and mitigate this, but it should be recognised that there was less activity and cost data from January to April compared to May to October.
2. **Collection sites:** One key limitation is that the collection sites did not include hospitals from all jurisdictions across Australia. Notably, there were no hospitals from the two largest states, New South Wales and Victoria. To the extent that the teaching and training cost structures of the costing sites are not representative of true differences in teaching and training costs by profession, geography, training stage or other distinguishing factors, then the classification may need to be refined as more TTR data is collected.

Classification development is always an iterative process and continued national data collection will enable classification refinement.

3. **Concentration of hospital information for specific specialties and groups:** The low volume of data collected for some specialties resulted in a small number of hospitals dominating the data set for some professional specialties.
4. **Dentistry and midwifery:** The sites which participated in the costing study had a smaller number of dentistry and midwifery trainees compared to other professions. Therefore, limited data was collected for the dentistry and midwifery professions, which will limit the extent to which the data can be split into more granular end classes.
5. **Full range of trainees and teaching and training activities at sites:** While there was cost and activity data for a good range of professions and specialties collected as part of the costing study, sites indicated that they were not able to capture data on every trainee, so the available data does not reflect a fully absorbed teaching and training cost at each site.

## Data preparation

### Timeframes of data used

Data across all the months of the TTR Costing Study (i.e. the live data collection period as well as retrospective data) was utilised in the exploratory data analysis and data modelling stage.

### Trimming of outliers

Data sets are routinely trimmed to remove outlier records which may skew the results of the analysis. The TTR Costing Study data set was trimmed for high and low cost outliers which were subsequently removed. Additional data adjustments were undertaken to remove records with zero direct and indirect costs, out-of-scope trainee types, and zero or blank FTEs before carrying out the exploratory analysis and statistical modelling to develop the ATTC.

A more detailed account of how outliers were trimmed in preparing the data is at Appendix B.

## Exploratory analysis

The exploratory analysis looked at a number of candidate data variables in the TTR Costing Study data set in order to determine which variables should be considered in data modelling for the development of the classification structure.

Regression analysis was used to identify variables which were statistically significant ( $p < .05$ ) at predicting the average cost per FTE. The variables which were found to be statistically significant and considered for inclusion in the classification were:

1. **Profession:** Allied health, dentistry, medicine, midwifery and nursing.
2. **Stage of training:** Pre-entry student, new graduate and postgraduate/vocational student.
3. **Trainee type:** A more granular breakdown of the stage and the level of the trainee which captured the type and year of degree (e.g. undergraduate year one, postgraduate year two) or the year of training (e.g. basic trainee registrar, advanced trainee registrar).

#### 4. **Specialty:**

- a. For allied health, speciality refers to the specific allied health profession/discipline and applies across all of the stages of training.
- b. For medicine, speciality generally only applies to the postgraduate/vocational stage of training, where trainees have been accepted into a training program that, when successfully completed, will result in eligibility to apply for fellowship to a specialist medical college.
- c. For nursing, speciality generally only applies to the postgraduate/vocational stage of training, where trainees undertake training in order to obtain a qualification for an advanced scope of practice.

### **Data modelling for classification development**

The development of the ATTC used regression trees to determine the end classes of the classification. Regression trees were applied to generate a series of end classes using the chosen splitting variables identified in the exploratory analysis. Further details regarding the use of regression trees in the data modelling can be found at Appendix B.

Following early results from the use of unstructured regression trees, for example, an end class which grouped first year undergraduate physiotherapy students with advanced registrar surgeons, as the TTR Costing Study data indicated they had a similar cost profile, a principles based approach was taken to determine a higher level classification structure in the first instance, that could apply across all professions and stages of training only.

The results and potential end classes generated by the principles based approach and the regression tree modelling were overlaid with clinical consultation in order to ensure the end classes had clinical relevance. In addition to the clinicians and stakeholders on IHPA's TTRWG, IHPA approached a number of clinicians and professional associations outside of the TTRWG meeting, and undertook targeted consultation on the proposed ATTC. These included:

- IHPA's Clinical Advisory Committee, which includes representatives from medical, nursing and allied health professions
- The Chief Allied and Scientific Health Adviser, South Australia
- Allied Health Professions Australia
- The Dean of the Faculty of Dentistry, University of Sydney
- Australian Dental Association
- Dental Board of Australia
- Council of Deans of Nursing & Midwifery (Australia & New Zealand)
- Australian College of Midwives
- Australian College of Nursing

In order to better understand the influence of costs by hospital sites on the proposed ATTC end classes, further analysis was undertaken on the TTR Costing Study data at a hospital level to understand whether any variables or end classes were being driven by high costs or high volume of trainees in particular hospitals.

This analysis confirmed that there were significant differences in the average direct and indirect cost per FTE across the hospital sites, with costs per trainee per FTE per month ranging from \$33 up to over \$1,600. There was also a significant difference in the size of the hospitals with five smaller non-metro hospitals having fewer than 300 trainee FTE, while three larger hospitals had more than 7,000 trainee FTE.

The additional analysis also demonstrated that a small number of high cost hospitals heavily influenced the inclusion of particular medical specialities or allied health disciplines into the higher or lower cost speciality groups. That is, once the data was re-centred to remove the variation caused by hospital influence, a number of medical specialties and allied health disciplines moved end classes from higher cost specialty groups to lower cost speciality groups or vice versa.

Following consultations with clinicians and peak bodies, trainee type (type of qualification and year of training) and specialty (medical or nursing specialty or allied health discipline) have not been included as variables in the ATTC Version 1.0. Feedback from clinicians during IHPA's initial consultations confirmed that some of these groupings using these two variables did not have face validity or there was not strong evidence to warrant their inclusion at this stage. For example, feedback from clinicians suggested that there was not strong evidence as to why postgraduate and undergraduate pre-entry students would have significantly different costs for a hospital. However most confirmed it was important to capture this information in the ongoing data collection as there may be certain professions or allied health disciplines where this could be material.

Furthermore, while the advice was that there is likely to be a cost difference between pre-entry students in early years and later years, there was not strong evidence to suggest an appropriate year to delineate between early years and later years at this stage. All stakeholders consulted suggested year of training should be part of the ongoing data collection for teaching and training.

Based on clinical advice and analysis which has demonstrated the strong influence of certain hospitals, which either had high costs or a high volume of particular trainees, the classification structure in the first version of the ATTC is high level.

## 4. ATTC Version 1.0

This section describes the classification hierarchy and end classes in the ATTC Version 1.0. While initial modelling of the TTR Costing Study data set supported the creation of a larger number of end classes, a more conservative approach has been considered which will result in a higher level classification structure for the first version. Additional end classes and granularity will be considered in the future when supported by data in the ongoing ABF activity and cost data collection.

### **ATTC Version 1.0**

The ATTC Version 1.0 is based on analysis of the TTR Costing Study data set, the additional analysis undertaken to investigate the impact of hospital variation in the data set, and the findings from the consultations conducted with TTRWG members and other clinical stakeholders to date.

The draft ATTC consists of two-levels only:

#### ***Level 1 – Profession***

The first level classifies a trainee into one of five professions: allied health, dentistry, medicine, midwifery, and nursing.

#### ***Level 2 – Training stage***

The second level classifies each trainee into a training stage: pre-entry student, new graduate, postgraduate/ vocational student.

Figure 1 describes the ATTC schematic hierarchy. The end classes in the ATTC Version 1.0 are listed in Table 1.

Figure 1: Diagram of structure of the ATTC Version 1.0

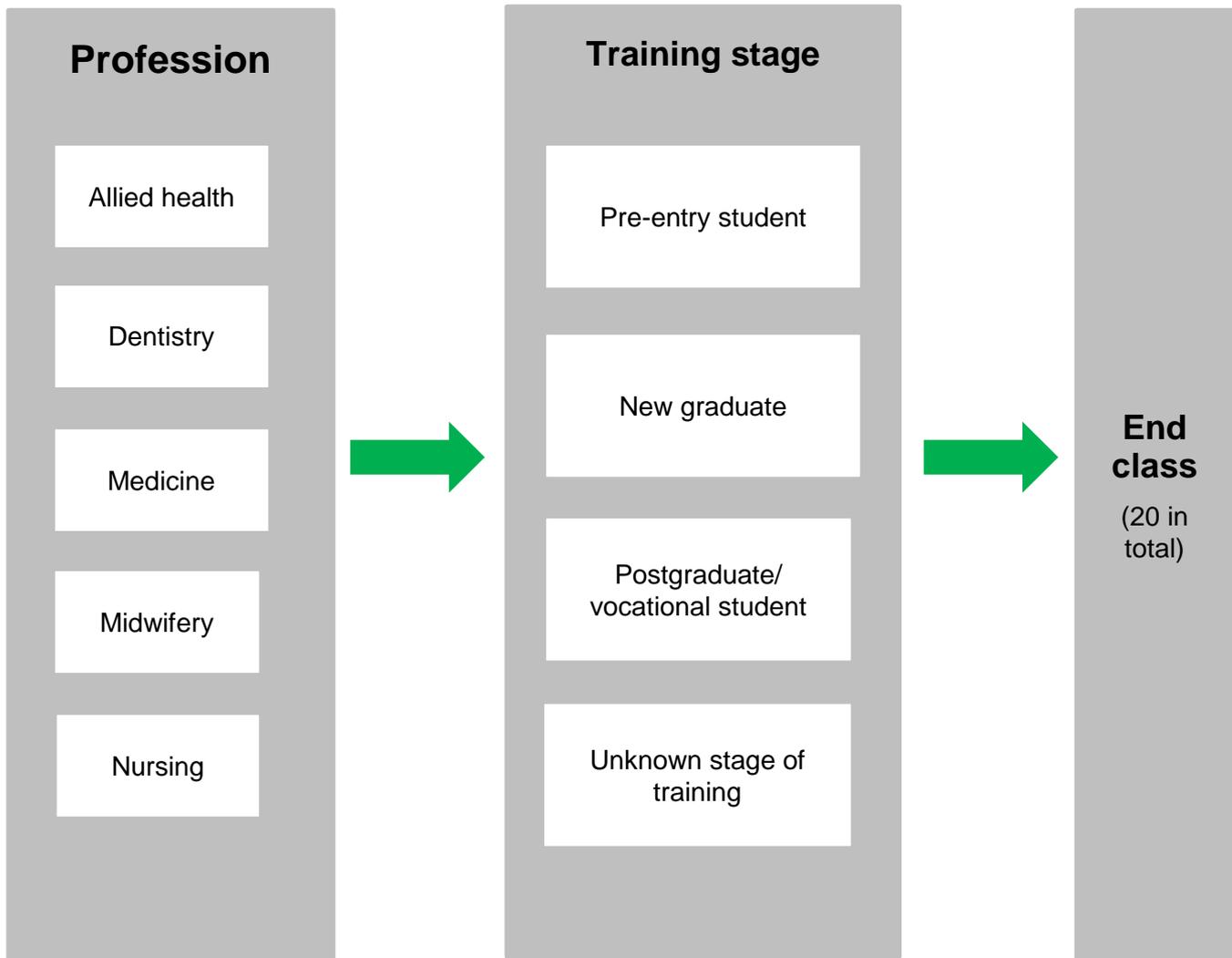


Table 1: End classes in the ATTC Version 1.0

Class Code	Profession	Stage of training
A1-01	Allied health	Pre-entry student
A2-01	Allied health	New graduate
A3-01	Allied health	Postgraduate/vocational student
A4-01	Allied health	Unknown stage of training
B1-01	Dentistry	Pre-entry student
B2-01	Dentistry	New graduate
B3-01	Dentistry	Postgraduate/vocational student

Class Code	Profession	Stage of training
B4-01	Dentistry	Unknown stage of training
C1-01	Medicine	Pre-entry student
C2-01	Medicine	New graduate
C3-01	Medicine	Postgraduate/vocational student
C4-01	Medicine	Unknown stage of training
D1-01	Midwifery	Pre-entry student
D2-01	Midwifery	New graduate
D3-01	Midwifery	Postgraduate/vocational student
D4-01	Midwifery	Unknown stage of training
E1-01	Nursing	Pre-entry student
E2-01	Nursing	New graduate
E3-01	Nursing	Postgraduate/vocational student
E4-01	Nursing	Unknown stage of training

## Performance of the splitting variables

The proposed end classes with FTE numbers, average cost, and coefficient of variation (CV) values based on the data set from the TTR Costing Study are at Appendix C. CV is a statistical measure often used in classification development. It represents the dispersion around the average in a data sample, with the larger the CV, the greater the variability around the average. Generally, the aim is to have a lower CV (less than 1.0) for the majority of end classes as this means there is a relatively small variation within the end class.

The data presented in Appendix C is presented as the number of FTEs and average cost per month and is not an annualised figure.

## Variables for consideration in future versions of the ATTC

While the first version of the ATTC contains only two levels, with further activity and cost data, refinements can be made to increase the specificity related to trainee characteristics and add additional levels and end classes.

Based on the data analysis to inform the development of the ATTC, there is strong evidence that the following variables are cost drivers. These variables were not included in the first version of the ATTC as consultations with clinicians indicated that some of the groupings did not have face validity to warrant their inclusion in the classification at this stage. For example, clinicians consulted suggested that while there was not strong evidence as to why postgraduate pre-entry students and undergraduate pre-entry students would have significantly different costs for a hospital, there is likely to be a cost difference between pre-entry students in early years and later years. Therefore, IHPA is proposing to continue to collection the following data items in the HTTRA NBEDS going forward:

- Year of training – the year of an accredited education course that a trainee is enrolled in (for example, year one, year two, basic registrar, advanced registrar).
- Area of clinical focus – the specific field of healthcare which is the primary focus of the training in which a trainee is enrolled in (for example, allied health discipline, medical speciality, nursing specialisation).
- Level of qualifying education certification – the type of academic certification of the registered training program that a trainee is currently enrolled in (for example, bachelor degree, diploma, postgraduate degree).

### **Consultation questions**

1. Are the current variables included in the ATTC Version 1.0 relevant to clinicians, health service managers, and other stakeholders?
2. Are there any further considerations in relation to the proposed structure?
3. Are there other variables which should be considered in future versions of the ATTC?

## 5. Next steps and further opportunities to participate

The ATTC's current groupings are based on available data obtained through the TTR Costing Study. As with any new classification, the refinement of the ATTC is an iterative process and IHPA will further refine the ATTC as more teaching and training activity and cost data becomes available. Reporting of teaching and training activity data will be undertaken by jurisdictions as per the HTTRA NBEDS, and costing as per the NHCDC AHPCS.

The version of the ATTC does not uniquely identify all professional specialties and disciplines at a granular level, as data to support classification development will need to be sourced over the coming years through the gradual establishment of data collection infrastructure and processes. Part of the consultation processes and developmental work for the first iteration of the ATTC will serve to identify areas of focus for future work.

Experience from other streams currently funded through ABF has demonstrated that the infrastructure and processes underpinning national data collection take time to develop and mature. To implement the ATTC, states and territories will need to adapt existing information systems, conduct training, and develop local policies and procedures to promote consistent reporting of teaching and training activities.

Since July 2014, states and territories have been encouraged to report national teaching and training activity data on a best endeavours basis to assist in the development and future refinement of the ATTC. In 2015, IHPA received 2014-15 teaching and training data from two states. In 2015-16, IHPA received teaching and training data from three states.

The development and refinement of the ATTC will need to be led in part by ongoing and improved data collection, but also clinical support and leadership. IHPA, in collaboration with the TTRWG, is receiving strong cooperation and enthusiasm for a nationally consistent way of classifying all types of hospital teaching and training activities and associated costs, in order to better manage, measure, and fund these activities efficiently and with transparency in the future.

IHPA recognises the diversity within the public hospital health sector and is committed to engaging the sector through its existing working group and advisory committee structures, clinical reviews, and public consultation processes. IHPA will continue to involve the TTRWG, other IHPA committees and key stakeholders in the development of the ATTC Version 1.0.

### **Finalise ATTC Version 1.0**

In early 2018, IHPA will finalise Version 1.0 of the ATTC. This will be informed by the feedback received from this public consultation paper.

Once Version 1.0 of the ATTC has been developed and approved by the Pricing Authority, IHPA will promote information about the ATTC to peak bodies and other lead organisations in preparation for national implementation on a best endeavours basis commencing 1 July 2019.

Classification supporting materials, such as a User Manual and ATTC Grouper software, will be developed. IHPA will also develop fact sheets, articles in the newsletters of peak bodies and educational institutions, an infographic, and/or an animation. These materials will serve to inform the sector of the benefits of the ATTC, the development of the ATTC, the definitions of teaching and training for ABF purposes, and the classifications role in determining an ABF pricing approach for teaching and training activities in the future.

### **Consultation questions**

4. What supporting material would be beneficial for the ATTC?
5. What communication avenues and methods should IHPA consider in order to inform and engage stakeholders of the ATTC and future ABF for teaching and training?

## **National implementation of the ATTC**

Following the findings of this initial public consultation process and further refinement, it is expected that Version 1.0 of the ATTC and its supporting documents will be presented to the Pricing Authority in June 2018 before being released to states and territories to implement on a best endeavours basis from 1 July 2019.

The implementation of the ATTC will take time. As with other new classifications, IHPA acknowledges that states and territories will need to develop new or refine existing data management systems, conduct training, and develop local policies and procedures in order to implement the ATTC and collect and cost data in accordance with the classification.

## **Development of future iterations of the ATTC**

The TTR Costing Study data set has provided strong evidence that variables such as type of qualification, year of training, medical or nursing speciality and allied health discipline are predictors of costs of trainees. Ongoing national activity and cost data are required to determine more specific and stable end classes; for example, the allied health disciplines or medical specialities that are consistently associated with higher costs at all hospitals.

Version 1.0 of the ATTC does not provide an end class for each profession's specialty or discipline. In keeping with the principles of classification development, the ATTC must involve a clinically meaningful yet administratively feasible number of end classes through the grouping together of specialties and disciplines where appropriate. As with other classification systems, IHPA will refine the ATTC as more data that assembles specialties and disciplines into clinically relevant cost groups becomes available.

IHPA is currently working with the TTRWG and other key stakeholders to broaden the scope of the HTRA NBEDS for 2018-19 to enable reporting of additional data items which will support future iterations of the ATTC. The regular refinement of the HTRA NBEDS will assist in the collection of additional data items such as specialties. However, IHPA notes that the list cannot be exhaustive as it needs to be manageable in order to be meaningful.

### Consultation questions

6. Are there particular aspects or areas of the ATTC that should be prioritised in its development, or aspects that should be developed at a later stage?
7. Are there any further considerations that should be taken into account when developing the ATTC?

### Pricing teaching and training activities using the ATTC

The teaching and training costs derived from the TTR Costing Study are not indicative of future teaching and training prices. The pricing of teaching and training activities is a separate process to classification development and requires a representative number of hospitals and jurisdictions to report teaching and training activity and cost data. IHPA will work with stakeholders to determine an appropriate representation and volume of data to undertake further development as data becomes available. Development of prices also involves removing any out of scope costs, such as other Commonwealth funding, assessing the need for adjustments to cover variations in costs not accounted for in the classification and projection of costs (indexation) to inflate the costs to reflect the year being priced and the total costs in the hospital system.

Based on varying capacity of states and territories to implement the ATTC, teaching and training activities will continue to be block funded in the interim. Following the development of the ATTC, IHPA will work with jurisdiction to progress the collection of ongoing cost and activity data and will seek views on pricing teaching and training activities through its working groups and advisory committees and the annual consultation on the Pricing Framework for Australian Public Hospital Services.

Further, in developing the ATTC, hospital level variables such as metropolitan or non-metropolitan location were not considered as splitting variables. Instead the focus was on splitting variables related to the trainee. Like other ABF models, when IHPA considers the pricing process for teaching and training activities, it will allow for investigation of loadings and adjustments for legitimate variations in costs not accounted for in the ATTC. Currently there are adjustments for Indigenous status and remoteness that account for unavoidable costs in the admitted setting. Adjustments for unavoidable costs could similarly be considered in the teaching and training space.

# Appendix A: TTR costing study sites

Table 2: Sites which participated in the TTR Costing Study 2015

Hospital site	Jurisdiction
Emerald Hospital	Queensland
Gladstone Hospital	Queensland
Gold Coast University Hospital	Queensland
Mackay Base Hospital	Queensland
Mount Isa Hospital	Queensland
Nambour General Hospital	Queensland
Princess Alexandra Hospital	Queensland
Proserpine Hospital	Queensland
Redcliffe Hospital	Queensland
Robina Hospital	Queensland
Rockhampton Hospital	Queensland
The Royal Brisbane & Women's Hospital	Queensland
The Prince Charles Hospital	Queensland
Women's and Children's Hospital	South Australia
Armadale-Kelmscott Memorial Hospital	Western Australia
Kalgoorlie Hospital	Western Australia
Rockingham General Hospital	Western Australia
Royal Perth Hospital	Western Australia
Sir Charles Gairdner Hospital	Western Australia

# Appendix B: Detailed outputs from statistical analysis and technical information

This Appendix describes the statistical analysis and technical work that underpinned the development of the ATTC Version 1.0.

## Trimming of outliers

As a result of exploratory work, the trimming method used to remove outliers in preparing the data was similar to the existing episodic trimming carried out for ABF models such as the acute admitted and subacute models.

An examination of probability density plots did not suggest the existence of outliers with extremely low average training cost, with the exception of those where there was zero direct and indirect training cost which were subsequently removed. Hence, the final adopted outlier trimming methodology applied is as follows.

**Step 1:** observations identified using the top 5 percent and 3\* interquartile (IQR) range (the range between the 1st and 3rd quartiles) away from the quartiles method are flagged as potential outliers

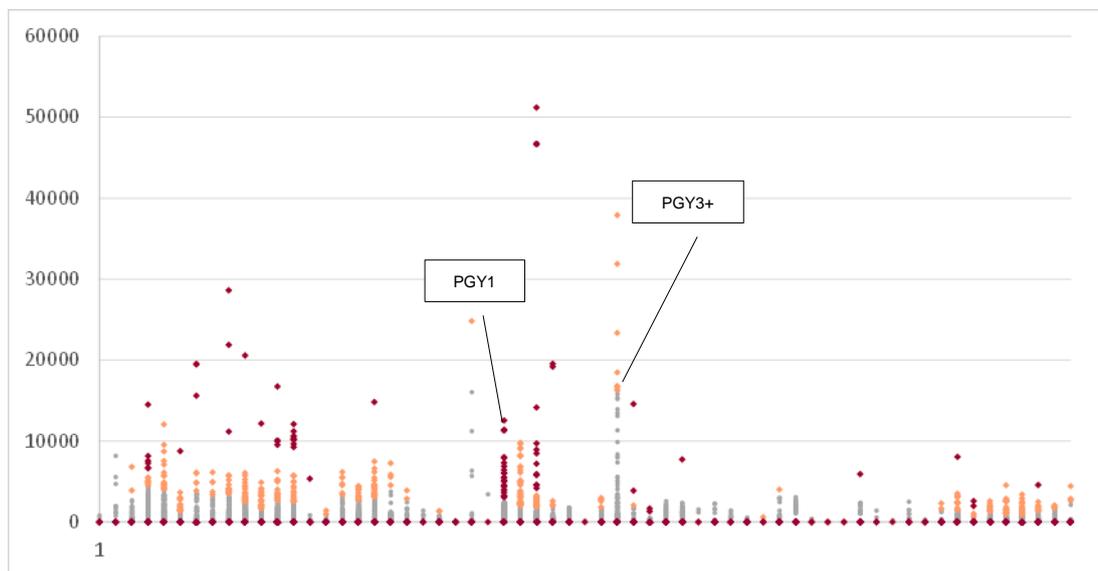
**Step 2:** observations within each trainee type are then ordered from lowest to highest and the difference between observations are measured, starting from the lowest observation

**Step 3:** if the difference between observations is 3 or more times the difference between the largest observed difference up to that point and the observation has been flagged in step 1, then the observation is considered an outlier

**Step 4:** all further observations (after the one identified in Step 3) in that trainee group are considered outliers.

The results of applying the outlier methodology are shown in Figure 2. The potential outliers (Step 1) are highlighted in orange and the outliers adhering to the above rules (after Step 4) are highlighted in brown.

Figure 2: Outliers identified using top 5%, 3\*IQR and the difference rule for each trainee type - using direct and indirect cost/FTE

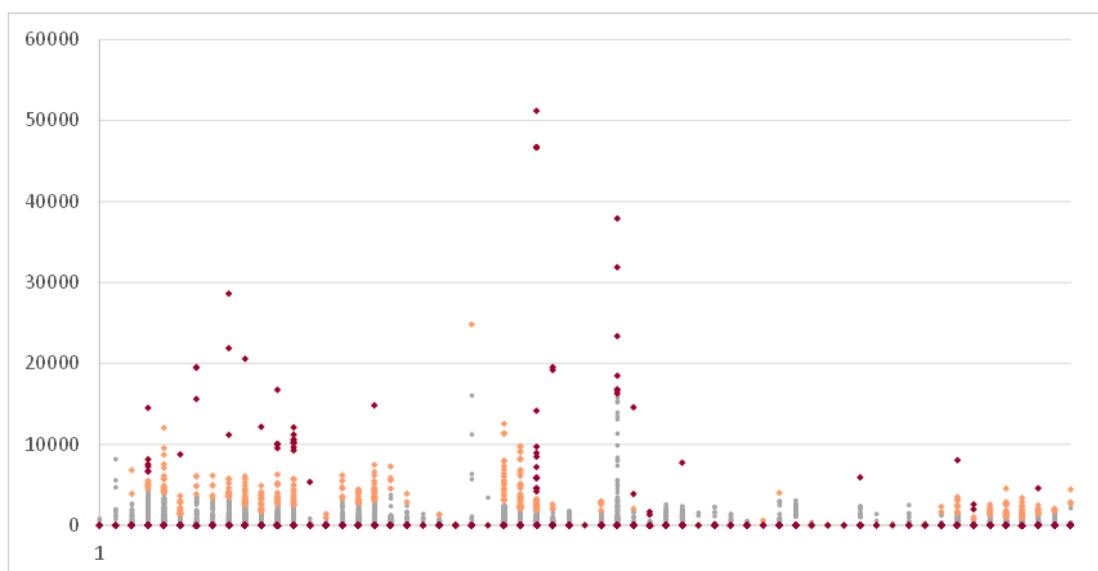


Two further adjustments were applied to the final outlier methodology:

- The postgraduate year 1 (PGY1) students, flagged as outliers under the methodology were treated as in-scope observations as they appeared to be a legitimate second cluster of observations rather than information erroneously recorded.
- A portion of the postgraduate year 3 or greater (PGY3+) students did not appear to follow the standard costs of PGY3+ students and were subsequently flagged.

The final outliers identified after the two further adjustments were made are shown in Figure 3.

Figure 3: Outliers identified after manual adjustments - using direct and indirect cost/FTE



The outlier and other records removed prior to the exploratory analysis and data modelling are identified in Table 3.

Table 3: Records removed from the TTR Costing Study final data set prior to exploratory analysis and data modelling

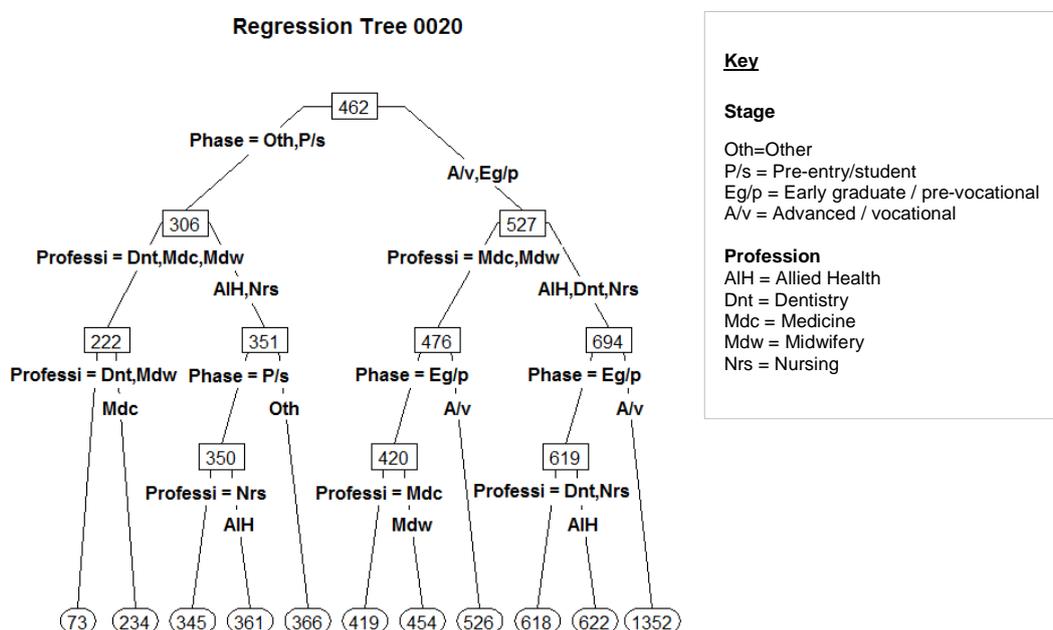
TTR Costing Study data set	Number of records
TTR Costing Study 'raw' data set	10,446
Observations with zero direct and indirect costs removed	479
Observations with zero or blank FTEs removed	38
Observations which were flagged for exclusion in the raw data file as part of the TTR Costing Study data set finalisation removed	401
Outliers removed	63
ATTC modelling data set	9,465

## Regression trees and the development of the ATTC

The development of the ATTC used regression trees to determine the end classes of the classification. Regression trees are a model which attempt to determine the optimal way to apply a series of binary (yes/no) rules with the goal of determining the most predictive model for the response variable; in this case, the average direct and indirect cost per FTE.

Regression trees were applied to generate a series of end classes using the chosen splitting variables identified in the exploratory analysis. Figure 4 contains an example of regression tree output for an exploratory tree splitting by profession and stage of training only.

Figure 4: Example regression tree output



At the beginning of the modelling process, the data was aggregated in one group (commonly referred to as a node). A node consists of a single input variable used for splitting (for example stage of training) and the binary decision rule used to split the data into two. In the example shown in Figure 4, in the first node the data was split by stage and all observations with a stage that were advanced/vocational or early graduate/pre-vocational were separated to the right branch of the tree and all other observations moved to the left branch of the tree.

Those observations that were either advanced/vocational or early graduate/pre-vocational were then split by profession and continued to be split at each node until the end of the tree. Each node only applied to observations which met the decision rules leading up to that node and different nodes may have had different decision rules. For example on the right hand branch, advanced/vocational and early graduate/pre-vocational students were split by profession with allied health, dentistry and nursing split from medicine and midwifery. On the left hand branch, all other students were split by profession with allied health and nursing in one group and dentistry, medicine and midwifery in another group.

At each node, a regression tree considered which predictor variable was the most optimal for splitting the data into the most distinct groups, considering not only the current split but also possible future splits up to a set depth. The regression tree model continued to split nodes until there were no further nodes. The numbers in Figure 4 represent the average cost per FTE per month in each of the nodes.

Further testing using the Mann-Whitney-Wilcoxon test was conducted to determine the validity of splits produced by the regression trees and whether terminal nodes would have benefited from further splitting. As the regression tree process was used in combination with qualitative clinical consultations, resulted in a small number of candidate variables, and were kept to an interpretable size, they were considered to be an appropriate tool to guide the development of the ATTC.

# Appendix C: ATTC Version 1.0

Table 4: Count of FTE, average cost and CV per ATTC end class, TTR Costing Study Data Set 2015

ATTC Class Code	Profession	Stage of training	FTE	Average cost per FTE per month	CV
A1-01	Allied health	Pre-entry student	3,386	368	1.42
A2-01	Allied health	New graduate	1,446	628	1.20
A3-01	Allied health	Postgraduate/vocational student	58	618	1.41
A4-01	Allied health	Unknown stage of training	378	246	0.76
B1-01	Dentistry	Pre-entry student	169	86	0.74
B2-01	Dentistry	New graduate	31	39	0.06
B3-01	Dentistry	Postgraduate/vocational student	13	3,039	0.12
B4-01	Dentistry	Unknown stage of training	-	-	0.00
C1-01	Medicine	Pre-entry student	6,209	238	2.14
C2-01	Medicine	New graduate	15,458	450	1.51

ATTC Class Code	Profession	Stage of training	FTE	Average cost per FTE per month	CV
C3-01	Medicine	Postgraduate/vocational student	16,159	610	1.46
C4-01	Medicine	Unknown stage of training	21	166	3.05
D1-01	Midwifery	Pre-entry student	155	140	1.19
D2-01	Midwifery	New graduate	103	454	1.20
D3-01	Midwifery	Postgraduate/vocational student	34	765	0.92
D4-01	Midwifery	Unknown stage of training	1	867	0.00
E1-01	Nursing	Pre-entry student	8,697	350	1.70
E2-01	Nursing	New graduate	8,350	623	1.38
E3-01	Nursing	Postgraduate/vocational student	1,050	1,377	0.72
E4-01	Nursing	Unknown stage of training	105	801	3.65

NB: FTE values have been rounded

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