The New Zealand Advanced Choice of Employment (ACE) Scheme: analysis after 7 years of District Health Board cooperation in a competitive employment context

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Abstract

Aim The Advanced Choice of Employment Scheme (ACE) coordinates the appointment of postgraduate year 1 doctors in New Zealand (NZ). ACE is a voluntary collaborative operation by all 21 of NZ's District Health Boards (DHBs). This audit evaluates the performance of ACE over its first 7 years of operation.

Methods The proportion of applicants successfully matched and the correlation between their preferred and matched DHBs was evaluated. Qualitative performance was assessed through survey of NZ trainee interns (TIs).

Results Nearly all (99–100%) NZ TIs using ACE have been successfully matched each year. Most (96–99%) of the successful applicants have been matched to one of their top-four preferred DHBs, and a mean of 81% to their most-preferred choice. Qualitative satisfaction with ACE was high (90% good). Applicant concerns included the usability of the online application portal and uncertainty about the fairness of the ACE algorithm.

Conclusion The ACE scheme has been highly successful for allocating PGY1 positions over 7 years and achieves generally high applicant satisfaction. DHBs have successfully cooperated despite their competing interest in recruiting top applicants. This study supports the contention that increased collaboration between DHBs may improve efficiency within the NZ health sector.

The Advanced Choice of Employment (ACE) Scheme is a job-matching system for the allocation of postgraduate year 1 (PGY1) house officer positions in New Zealand. ACE was conceived by the New Zealand (NZ) Medical Students’ Association in the mid 1990s in response to dissatisfaction with the previous unfacilitated (laissez-faire) employment process, which was perceived as inefficient and frustrating by many applicants. Prior to ACE, the recruitment process often continued over many months of protracted negotiations, during which time little certainty was provided to many of the applicants and DHBs. The ACE Scheme was implemented by the NZ District Health Boards (DHBs) in 2003 and has now completed its seventh year of operation.

The initial outcomes of the first 2 years of operation of the ACE Scheme were reviewed in a previous article which concluded that the ACE Scheme was "highly effective in assisting smooth transition from education to the PGY1 workforce". In both years, the high majority (96%) of successful applicants secured employment in one of their four most-preferred hospitals. Survey respondents in that study voiced generally high satisfaction with ACE.
The viability of ACE is dependent on the ongoing cooperation of all DHBs in complying with the agreed ACE procedures and time frames. One significant potential threat to this cooperation, for example, is the fact that the DHBs are in direct competition for junior doctors. There is currently a national shortage of junior doctors in New Zealand in the face of increasing demand, posing a threat to effective care.

The present study aimed to determine whether the ACE scheme has continued to achieve efficient matching of applicants to positions, and has continued to produce high satisfaction ratings. This was achieved by auditing all of the major ACE outcomes over its 7 years of its operation to date. In addition, the previous 2004 satisfaction survey was repeated on the most recent group of ACE applicants. A discussion is presented regarding the place of the ACE scheme as an example of effective "market design" in medical workforce management and planning in New Zealand.

Overview of the New Zealand ACE Scheme

In 2002, all 21 of New Zealand's DHBs committed to a centralised recruitment strategy for first-year house officer positions. The key component of this centralised strategy was a coordinated process for accepting applications and allocating applicants to first-year house officer positions. This coordinated job-matching process was called the ACE Scheme, and has been in constant use since its implementation in 2003.

Also ongoing since 2003 have been the adjuvant components of the centralised recruitment strategy, including advertisement of the recruitment process through a website and booklets. Potential applicants are also all invited to two educational events that provide them with an opportunity to learn about the ACE Scheme before they apply. The first event is a presentation evening at each medical school that is followed by a question and answer session. The second event is a DHB roadshow in which each DHB has an information stall at each medical school to interact with their potential applicants.

The ACE Scheme is coordinated by a central body (The ACE Centre) which reports to District Health Boards of New Zealand (DHBNZ)—an association that acts in the interest of the DHBs on agreed national issues. ACE is currently administered, through a tendered contract, by Auckland Regional Resident Medical Officer Services (ACE Centre 2009).

Applicants for PGY1 house officer positions in New Zealand make a single application to the ACE Centre through an on-line portal (http://www.acenz.net.nz/login.asp). This portal enables the applicant to rank the hospitals at which they would be willing to work. Applicants do not rank hospitals at which they would be unwilling to work, thereby ensuring they will not be forced to work in a location against their will. Applicants also submit their curriculum vitae and references via the on-line portal. Certain documents are still required to be submitted in hard copy via post (for instance, certified copies of university transcripts).

The ACE Centre then distributes these application packages to all of the hospitals that the applicants have ranked. The hospital personnel, who are blinded to the applicants’ preference rankings, prepare their own ranking of their applicants and return this list
to the ACE Centre. Hospitals do not rank applicants who they would be unwilling to employ, thereby ensuring that they are not forced to hire candidates that they deem to be unsuitable. Hospitals are also required to officially report their quota of available PGY1 positions to the ACE Centre.

A computer algorithm is then used to essentially mimic the previous sequential postal process, where jobs were offered, accepted or rejected and then the residual jobs re-offered to the next ranked applicants. In brief, this algorithm impartially matches the two ranked preference lists received from applicants and DHBs. Candidates are matched to their most preferred hospital that had ranked them within their quota boundary of available positions through repeated iterations of the algorithm.

This process is completed within a strict timeframe and all job offers are released on the same date. If unfilled positions remain after this initial match it is possible to enter a subsequent round of matching.

Apart from general improvements to its electronic capabilities, the ACE Scheme has essentially remained unchanged since its inception.

Methods

Audit of ACE matching outcomes—Applicant data is recorded annually by the ACE Centre, including the number of PGY1 applicants, the number of hospitals they applied to, and their New Zealand residency status. The number of total available job vacancies and the outcomes of the matching algorithm are also recorded. Data for the whole duration of ACE’s implementation (2003-2009) was made available from the ACE Centre, and was used to quantitatively evaluate the ACE Scheme’s efficacy.

The primary outcomes assessed were the proportion of TIs who were successfully matched, and how the hospital positions secured by the applicants correlated with their preference rankings. The efficiency of the ACE process was further evaluated by recording the number of matching rounds required to fill all of the available jobs or to place all of the available candidates.

ACE applicant survey—Qualitative satisfaction of the ACE scheme was assessed via an online survey of New Zealand trainee interns (TIs) graduating in 2009. Survey invitations were sent to all of the 270 TIs without exclusion. The survey was identical to the ACE satisfaction survey conducted by Pole et al in 2004. The principal questions evaluated applicants’ satisfaction with the scheme, and their understanding of the scheme. Respondents were also asked if they had applied for employment outside of New Zealand—information that is not recorded by the ACE Centre.

Further survey questions were used to guide potential improvements in the ACE scheme’s delivery. These questions asked TIs whether they attended the two ACE educational events, and whether they were of use, or could be improved.

Space was also provided for respondents to provide comments with their responses, and TIs were specifically invited to additionally comment on whether they felt the matching process was transparent, and whether they felt a fair outcome was provided. A thematic analysis of the commented responses was undertaken to identify aspects of the ACE scheme that were problematic for applicants.

The survey was conducted after the matching algorithm was complete and job offers had been posted. A potential source of bias in this survey is therefore that applicant satisfaction with ACE could be dependent on whether an applicant was matched to one of their preferred hospitals or not, an outcome that is independent of the ACE matching algorithm. To evaluate the validity of the survey, two questions were therefore included to compare the survey response population against the total ACE applicant population as provided by the ACE Centre. These questions asked: "Did you get your first choice DHB?", and "How many DHBs did you apply for?".
Results

ACE matching outcomes—The matching of candidates to their preferred (ranked) hospital choices has shown a high level of consistency over the 7 years of ACE (Table 1). Overall, a high proportion of all applicants have been placed in one of their top 4 preferred DHBs (range 96-99%) and between 72% and 84% have been matched to their most preferred DHB (mean 81%, SD 5%; [95% CI: 76, 85]).

Table 1. Cumulative percentage of successful applicants vs matched DHB preference rank

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<td>79%</td>
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In the last 4 years, a number of NZ TIs have withdrawn from ACE prior to the algorithm being run (range 1-17). Excluding these withdrawn applicants, the proportion of NZ resident/citizen graduates gaining positions through the ACE scheme is high, with 100% successfully being matched for 2006-2009, and 99% being matched for 2004-2005 (Table 2). In 2003, (the inception year of ACE), 14 TIs were initially unmatched, however this outcome was noted by the ACE staff and the DHBs subsequently facilitated positions for 12 of these unsuccessful applicants.

Table 2. Applicant match success by year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of PGY1 Applicants</th>
<th>Number of PGY1 Vacancies</th>
<th>Number of Applicants Placed (%)</th>
<th>Proportion of NZ TIs Matched (%)</th>
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<tr>
<td>2009</td>
<td>329</td>
<td>351</td>
<td>320 (97%)</td>
<td>309/312 (99%)**</td>
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<tr>
<td>2008</td>
<td>345</td>
<td>336</td>
<td>317 (90%)</td>
<td>281/298 (94%)**</td>
</tr>
<tr>
<td>2007</td>
<td>329</td>
<td>324</td>
<td>313 (91%)</td>
<td>281/282 (99%)**</td>
</tr>
<tr>
<td>2006</td>
<td>346</td>
<td>313</td>
<td>311 (90%)</td>
<td>279/288 (97%)**</td>
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<tr>
<td>2005</td>
<td>338</td>
<td>308</td>
<td>308 (91%)</td>
<td>285/286 (99%)</td>
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<tr>
<td>2004</td>
<td>413</td>
<td>301</td>
<td>299 (72%)</td>
<td>289/291 (99%)</td>
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<tr>
<td>2003</td>
<td>404</td>
<td>304*</td>
<td>304 (75%)</td>
<td>297/316 (94%)</td>
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* Subsequently increased by 12 to accommodate 14 TIs who were initially unmatched; **100% of TIs who did not withdraw from ACE prior to matching were allocated positions.
The total number of ACE applicants has fallen over the 7 years of the scheme (Table 2). The mean number of applicants in the first 3 years was 385 (SD 41) and in the recent 3 years the mean number was 334 (SD 9). The decline is due to fewer non-NZ TIs applying for jobs via ACE in recent years, with the number of NZ TI applicants remaining relatively steady (mean 296, SD 13; [95% CI: 284, 308]) (Table 2). The number of international medical graduates (IMGs) who apply to ACE each year has ranged between none (in 2008) and 26 (in 2004).

Overall, the proportion of the total applicants that have been successfully placed by ACE ranged from 72-75% between 2003 - 2004, and between 90-97% from 2005 - 2009. The proportion of non-NZ TI applicants successfully matched has ranged from 8% (2003 and 2004) to 77% (2007); overall mean 45% (SD 27%; [95% CI: 20, 72]).

The matching process has been completed and job offers made routinely within 5 weeks of the ACE application closing dates.

**ACE applicant survey**—Survey responses were received from 119 trainee interns (response rate of 44%). The respondents applied to a mean of 4.7 hospitals, and 83.8% got a job at their first choice DHB. These statistics were close to those reported from the total ACE population above (mean 4.2 hospital applications and 79% getting their first choice), demonstrating that the responder population was a reasonable approximation of the total ACE applicant population.

Satisfaction with the ACE process was rated as "good" by 90% of respondents, compared to 10% who rated satisfaction as "not so good" or "poor". Most respondents (73%) felt they had a "good" understanding of the ACE scheme, with 26% having a "partial" or "incomplete" understanding. Only 0.7% of respondents stated that they had a "poor" understanding of ACE.

A total of 65% (77 / 119) of respondents attended the ACE information evenings, and 55% (65 / 119) attended the DHB roadshows. Elective or clinical placements away from the event centres of Auckland, Hamilton, Wellington, Christchurch and Dunedin were cited as preventing access for many of the non-attendees.

The following qualitative themes were identified from the survey comments: overall positive experience (n=20), difficulties and dissatisfaction with using the ACE portal website (n=33), high satisfaction with the ACE Centre staff (n=10), and suspicion about whether the process was adequately blinded and the algorithm adequately impartial (n=10).

The strongest negative theme from respondents was difficulty uploading references to the portal, and many general comments indicated that the website could be improved in usability and educational content. In particular, concern was indicated that the website did not provide immediate feedback about whether a file upload was successful. There was also concern that there was no capacity to upload references from the beginning of the trainee intern academic year. A number of respondents noted that the website did not have comprehensive information available all year round.

A small number of TIs indicated uncertainty about the validity of the matching algorithm used by the ACE Centre, the level of security of their hospital ranking data, and whether their ranking of DHBs affected DHBs ranking of them or their chance of
being employed by lower ranked DHBs. However, a common positive theme was high satisfaction with the ACE Centre staff, and no negative responses were received regarding this theme. Trainee Interns indicated that they felt more confident in the ACE process after personal contact was made with ACE Centre staff.

**Discussion**

This study has audited the ACE scheme during its 7 years of operation to date, and has found that it has been able to match nearly all NZ TIs, with the high majority being matched to one of their most preferred DHBs. This process is managed to occur over a five week period which compares favourably with pre-2003 estimates of 12-14 weeks. Satisfaction among applicants has been high. Although DHB satisfaction criteria were not directly examined in this study, the ongoing commitment of DHBs to the ACE process indirectly indicates that it continues to provide value to DHB stakeholders. This study also reinforces the value of ACE to applicants, and presents a strong argument that it should be continued and safeguarded into the future.

The trainee intern satisfaction survey identifies a number of areas where the scheme could be further improved, all of which focus on the procedural aspects of its implementation. The main criticisms were that the website portal was not sufficiently user-friendly, and that the ACE educational sessions should be more widely available. Similar concerns were voiced in the previous audit of ACE in 2004\(^1\), so it is disappointing that they have not been adequately addressed in the intervening years.

The fact that 25% or more of trainee interns may be away on clinical rotations or electives when the principal educational sessions are held is a problematic barrier to educating Trainee Interns about ACE. This finding may be responsible for the ongoing concerns regarding the schemes’ transparency and fairness that were expressed by a minority of respondents. However, this educational access problem could be easily resolved with greater use of technologies such as online educational media resources, a solution that was also supported by several respondents in the survey. These observations will be fed back to the ACE Centre. These improvements have resource implications that would need to be addressed by the funders of ACE.

It was noted that following completion of matching through ACE a small proportion (1-6%) of applicants subsequently declined positions at their matched DHB. The reasons for this are not clear, however employment in Australia is a possible cause, because this group are able to readily gain employment there. This behaviour is a challenge to the agreement between stakeholders and therefore needs to be minimised. It could be discouraged by asking TIs during the ACE education sessions not to apply for a position if they intend not to follow through on the match.

We previously predicted the ACE scheme's utility as a tool for generating workforce data\(^1\). NZ's medical student training capacity is currently in a period of substantial growth, from 365 total annual TI graduates in 2008, to a target of 565 in 2013\(^2\).

Meanwhile, data from this study shows that the number of PGY1 positions have grown by 15% between 2003 - 2009, and that the number of vacancies now exceeds the number of applicants.

Data here also shows that international medical graduates are now successfully being matched via ACE to make up this shortfall, however a sustained decrease in the
number of these applicants is evident. An accelerated and substantial increase in
PGY1 positions will be required to accommodate the projected growth in NZ medical
graduates, and workforce data made available by the ACE centre will continue to
assist in the accurate monitoring of the supply and demand dynamics of the PGY1
workforce.

A potential confounding factor that may bias the reported efficiency of the matching
outcome (% of NZ TIs successfully matched) is the number of international medical
graduates (IMGs) applying through the ACE scheme. The quality and number of
these applicants has the potential to affect average New Zealand trained applicant
placement rankings. This is simply an expression of relatively unaltered job
availability (demand) and variable applicant volume (supply). The proportion and
quality of doctors applying from Australia is of particular interest as these applicants
are eligible for ACE on equal terms with NZ graduates (TIs are otherwise given
preference in the algorithm).

Australian applicants with stronger academic records or references may therefore be
able to out compete weaker NZ TIs. Non Australian IMGs are not able to compete in
the first round match and therefore have less impact on NZ Trainee Intern application
success rates. In terms of total % matched, our results demonstrate that this has not
been a major issue to date, because nearly all of the NZ TIs wanting to be matched
have successfully achieved one. Of interest, there has recently been a major expansion
in Australian medical school positions, which may impact on the matching outcomes
in future.

The information presented in this paper may be of interest to other jurisdictions where
employment matching of graduates is not performed currently. Our results show that
the ACE scheme is an example of effective "market design"—where intelligent
intervention in the hiring of new doctors has lead to a functional and highly efficient
market clearinghouse effect.

The National Resident Matching Program (NMRP), which similarly provides a
clearinghouse for new doctor positions across the United States, is a long-standing,
successful and well-documented "market design" project. The ACE Scheme
represents a similar development in the realm of New Zealand medical workforce
management and planning, which has been variously condemned in leading reports
as: 'fragmented', "iterative, ad hoc and poorly coordinated", and in need of 'better
coordination and a more integrated approach'.

Outcome data from the US residency MATCH scheme is not directly comparable to
the results of this study, because the US program matches applicants to both employer
and specialty training program. There is little other data in the literature with which to
compare matching efficiency and satisfaction.

ACE is directly dependent on the ongoing cooperation of all DHBs in complying
with the agreed ACE procedures and time frames. For example, if one DHB was to
offer PGY1 employment contracts outside of ACE and before the agreed date for
posting matched job offers, then this would convey an unfair advantage to that DHB,
and undermine the success of ACE. DHBs are in direct competition for junior doctors,
and there is a worsening national shortage of junior doctors in New Zealand."
The fact that the ACE scheme has maintained the confidence and participation of both employers and applicants, despite this highly-competitive employment context, is a strong testimony to its ability to satisfy the requirements of both these groups.

The voluntary nature of DHB participation in the ACE Scheme is also a risk for its long-term viability. Compliance with ACE relies on consensus and voluntary adherence, and a failure of consensus and voluntary adherence was a critical factor in the downfall of the earlier New Zealand MATCH scheme, a predecessor of ACE that operated in the 1980s.

The current emphasis on driving cooperation in the health sector, as manifested by the establishment of a National Health Board charged with "reduc(ing) duplication of information technology, payroll, logistics and other 'back office' services",7 should result in recognition of the ACE scheme as a successful example of organic stakeholder cooperation in a competitive environment.

Significantly, the concept of facilitated placement is being considered/used by Australasian Colleges. In particular, the Royal Australasian College of Physicians Trainees' Committee have recently called for a bi-national matching scheme for the allocation of advanced physician training positions.8 A controlled job-allocation process is already in place for many surgical trainees, via specialist training boards, albeit with necessarily less junior doctor discretion than ACE allows.

Seven years after its introduction, ACE is performing well. The scheme presents an effective example of successful market design within the New Zealand health context, and continued DHB cooperation should be encouraged.

Competing interests: None known.

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