A national survey of clinician’s knowledge of and attitudes towards implantable cardioverter defibrillators

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Introduction

Ventricular tachyarrhythmias remain a leading cause of mortality in western countries including New Zealand. In high risk populations, such as those who have had previous ventricular tachyarrhythmias (secondary prevention) or with significant left ventricular dysfunction (primary prevention), implantable cardioverter defibrillators (ICDs) significantly reduce mortality when compared with optimal medical therapy, and are now considered the standard of care.

In New Zealand the current annual implant rate for ICDs is 44/million, similar to that seen in the UK. A number of studies in the UK have demonstrated that patients with indications for ICD therapy are not yet receiving these devices. Estimates for the required implant rate to meet National Institute for Health and Clinical Excellence recommendations for primary and secondary prevention in the UK vary between 100 and 150/million/year. Implantable cardioverter defibrillator implantation rates in this range are achieved in Australia (142/million), Italy (125/million), Denmark (117/million), and a number of other European countries. Given that New Zealand has a similar burden of cardiovascular disease to these countries, our current implant rate is probably not meeting the existing need. At this point in time there are only four centres in New Zealand implanting ICDs, and there are no published national guidelines for ICD therapy.

Implantable cardioverter defibrillator implantation rates will be influenced by a large number of factors including the referral...
rate and the availability of resources to allow implantation. The attitudes and knowledge of clinicians who manage patients with ischaemic heart disease and heart failure are a key determinant of ICD referral rates. We conducted a phone survey of physicians and cardiologists throughout New Zealand to explore their knowledge and attitudes towards ICD therapy with a particular interest in their perceptions of potential barriers to ICD therapy.

**Methods**

**Structured interview**

We administered a 17-question structured telephone survey. The survey collected the demographic data about the respondents as well as information about the knowledge and perceptions relating to ICD therapy. Questions included the number of ICD patients cared for and previously referred, indications for receiving an ICD, familiarity with the content of international or proposed New Zealand guidelines, perceived survival benefits of ICD therapy, whether they agreed with the results of clinical trials, cost effectiveness of ICDs, a rating of their knowledge, and the issues believed to be important barriers to ICD implantation in New Zealand. The study was approved by the Central Regional Ethics Committee.

**Participant population**

We contacted the 25 public and 5 private hospitals in New Zealand that provide treatment for patients with heart failure and ischaemic heart disease and asked for the details of the cardiologists and physicians who were routinely responsible for the care of these patients, as these are the group who make referrals within the New Zealand health care system. Those who were electrophysiologists or who implanted ICDs were excluded from the study. A total of 122 clinicians who met these criteria were identified. During a 6-week period (7/11/2008 to 19/12/2008) we attempted to contact and survey these doctors. The participants were grouped based on whether they worked in a rural or urban hospital (rural if the population of that town was <50,000 according to the 2006 New Zealand census).

**Statistical analysis**

The responses are presented as percentages. Assessment of the differences in responses between cardiologists and physicians, rural and urban centres, and centres that did and did not implant ICDs were performed using either Chi-squared or an unpaired t-test where appropriate. Logistic regression analysis was performed to evaluate the relationship between the estimation of ICD cost and perception of ICD cost effectiveness. A P-value < 0.05 was considered to be statistically significant. All statistical tests were performed using SPSS Version 11 (SPSS Inc, Chicago).

**Results**

Of the 122 cardiologists and physicians identified, we were able to contact 114 during the study period. Of these 114, 100 completed the survey, an overall response rate of 82%. Only four individuals declined with another 10 unable to complete the survey during the study period due to time constraints. There were 21 clinicians-based at rural hospitals, 20 of whom were physicians. Overall, 35 participants identified themselves as physicians, and 65 as cardiologists. A total of 32 participants worked at the four hospitals that perform ICD implantation.

The majority (84%) of participants reported that they looked after at least one patient with an ICD, with 28% reporting that they looked after more than 10 patients with ICDs. The majority (90%) also reported that they had previously referred patients for ICDs, with 31% estimating that they had referred more than 10 patients.

**Levels of knowledge**

When asked to identify ICD indications, 80% cited previous symptomatic or sustained ventricular arrhythmia and 73% left ventricular dysfunction as indications for ICDs. Other standard indications were identified less frequently; long QT syndrome by 30%, hypertrophic cardiomyopathy by 19%, Brugada Syndrome by 11%, and arrhythmogenic right ventricular dysplasia by 10%. The average number of indications identified by rural participants was lower than by urban participants (1.5 ± 1.0 vs 2.5 ± 1.0, P = 0.001).

When asked if they were familiar with the content of international ICD guidelines, 62% reported that they were. Rural participants were less likely to report familiarity with international guidelines (33 vs. 71% of urban participants P = 0.007). Participants familiar with international guidelines were more likely to identify a greater number of indications (P = 0.009).

Only 25% of participants reported familiarity with the proposed New Zealand guidelines for ICDs, and 72% of these were from two regions, Waikato and Auckland. Rural participants were less likely than urban participants to be familiar with the proposed national guidelines (5 vs. 30% P = 0.008).

**Level of knowledge**

When asked to rate their knowledge of ICD indications, 50% rated their knowledge as satisfactory with 23% rating their knowledge as good and another 3% as very good. Only 1% reported their knowledge as very poor with 23% rating their current knowledge as poor. Rural participants rated their knowledge lower than urban participants (P = 0.001).

**Attitudes**

Participants were informed that the AVID study demonstrated an 8% absolute 2-year survival benefit in a secondary prevention population. They were then asked if they thought this was an accurate estimate of the real benefit. Only 54% thought this was accurate, with 30% reporting that the real survival benefit was greater than this, and 2% reporting it was less than this. The remainder (15%) reported that they did not know.

We told participants that the MADIT II and SCD-HeFT trials demonstrated a 5–7% absolute survival benefit at 2 years in a primary prevention population, and asked them if they thought this was an accurate estimate of the real benefit. The majority (65%) of participants believed that this estimate was accurate, but 19% stated that the real benefit was greater than this. Only 9% believing that the benefit was less than this with the remaining 7% reporting that they did not know.
Most participants (82%) believed that the use of ICD therapy for secondary prevention was cost effective with 9% thinking it was not and the other 9% being unsure. In contrast, only 53% believed that the use of ICD therapy for primary prevention was cost effective with 35% thinking it was not and the other 12% reporting that they were unsure.

The current cost of a single chamber ICD system (generator plus lead) in New Zealand ranges between NZ$ 000 and 30 000 (personal communication; N. Lever, S. Harding). When participants were asked to estimate the cost of a single chamber ICD system, responses varied widely (median NZ$20 000, range NZ$1000–55 000). Cost was correctly estimated by 53%, with 34% underestimating and 13% overestimating the cost. Interestingly, there was no relationship between the estimation of ICD cost and perception of cost effectiveness ($P = 0.30$).

### Barriers

When asked about specific factors that may limit access to ICD therapy, financial restrictions/cost issues (88%), lack of local expertise (61%), lack of local guidelines (51%), and the referral process (43%) were seen as significant barriers to ICD referral by many of the participants (see Table 1). Restricted access to investigations, such as echocardiography (24%), and patient perceptions (18%) were less likely to be considered barriers. Rural clinicians were less likely to think the referral process was an important barrier ($P = 0.03$). However, they were more likely to think restricted access to investigations was an important barrier ($P = 0.001$).

### Discussion

This is the first study examining the knowledge and attitudes of clinicians who refer patients for ICD therapy. We have identified a number of important barriers that are likely to limit referral of appropriate patients for ICD therapy. While the majority of participants rated their knowledge as satisfactory or better, a substantial proportion were not familiar with international ICD guidelines, and failed to identify either secondary prevention or left ventricular dysfunction as ICD indications. Clinicians generally believed secondary prevention was cost effective, but were less likely to consider primary prevention indications to be so. The majority of participants believed that lack of financial resources, lack of local expertise and lack of national guidelines were significant barriers to ICD implantation. Rural participants also believed that lack of access to investigations was a significant barrier.

Currently there are no published national guidelines for ICD indications within New Zealand, although a draft document does exist. New Zealand operates a national public health care system, and there is no policy statement outlining funding for ICDs within this system. In addition there is a growing private sector based around health insurance, but the large health insurers in New Zealand do not cover ICD implantation within their policies. In this context, perceptions of cost effectiveness may well influence referral practice. Only 53% believed ICD therapy for primary prevention of SCD was cost effective, compared with 82% for secondary prevention. Previous studies have shown ICDs to be cost effective in both these settings, although no previous work has examined referring clinician’s perceptions or knowledge of cost effectiveness.

While secondary prevention and left ventricular dysfunction were identified by the majority as indications for ICD therapy, other indications were not widely recognised. Almost a quarter of participants rated their knowledge as less than satisfactory, and 38% acknowledged not being familiar with international guidelines. Given that the New Zealand guidelines have either not been published or made publically available, 75% reporting that they are unfamiliar with these is not surprising. Just over half the participants stated that the lack of local guidelines was a barrier to referral.

The lack of clarity for the referral process was also perceived as a barrier by 43%. Some participants considered there was ‘inconsistency in how people access ICDs’ and ‘a need for standardised referral’. Others expressed the view that referral was ‘unnecessarily laborious’ and that a guideline document would ensure it was a simple, equitable process.

Those clinicians working in rural settings were more likely to be physicians, to be less familiar with guidelines and to rate their knowledge as less than satisfactory. They also identified fewer indications and reported limited access to investigations. These all combine to suggest that rural New Zealanders may have less access to ICD therapy than comparable urban-based patients. Significant regional variations in ICD therapy have been identified in the UK, but no explanation for these observations was offered. The limitations we have identified in this study may explain these regional variations.

A possible limiting factor in ICD therapy suggested by Cunningham et al. was limited service provision, and this was contrasted to the wider availability of pacemakers. In New Zealand only four centres currently implant ICDs. Overall, 61% of those surveyed in this study believed that lack of local expertise was a barrier to implantation. Expansion of the service that implants ICDs is

| Table 1 Showing the percentage of participants that rate each of the potential issues as barriers to referral of patients for ICDs. P-values are for a comparison of urban vs. rural clinicians |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Perceptions of barriers | Overall | Rural | Urban | P-value |
| Financial issues | 88 | 88 | 88 | 0.33 |
| Lack of expertise | 61 | 41 | 65 | 0.15 |
| Lack of guidelines | 51 | 41 | 53 | 0.47 |
| Referral process | 43 | 12 | 50 | 0.003$^*$ |
| Access to investigations | 24 | 71 | 18 | 0.001$^*$ |
| Patient perception | 18 | 18 | 18 | 0.52 |

*Shows significant difference ($P < 0.05$).
clearly required for New Zealand to significantly raise the current low implant rate, but this will only be possible with clear guidance around funding.

**Limitations of study**
The design of our study means that sampling bias can occur. We attempted to minimise this by identifying and trying to contact every cardiologist and general physician who treated potential ICD candidates in New Zealand. We are confident that we contacted the majority of the non-implanting cardiologists in New Zealand, but we are likely to have under sampled the general physician population, especially those who only see a small number of cardiac patients. Other potential barriers to ICD implantation, including the number of trained technologists, and implanting clinicians were not explored in this study.

**Conclusion**
We have found that limited financial resources, lack of local expertise and lack of national guidelines were viewed as significant barriers to ICD implantation in New Zealand. The widely held perception that primary prevention was not cost effective, along with limited access to investigations in rural areas are also likely to represent significant barriers to referral for ICD implantation. These findings may contribute to the low ICD implantation rate in New Zealand, and many of these issues are likely to exist in countries with similar health care systems and hence require further investigation. Clear national guidelines that included policy regarding funding and clarifying eligibility and the referral process are required, as these would address many of these barriers, but would not address the lack of local expertise or the resources.

**Conflict of interest:** none declared.

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**References**