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Modelling eligibility under national systems of compensation for treatment injury

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(NOT TO BE QUOTED, CITED OR DISSEMINATED WITHOUT PERMISSION)
Modelling eligibility under national systems of compensation for treatment injury

Abstract

How can different schemes of compensation for treatment injury be evaluated? This paper offers an empirical approach to assessment based on the simulation of alternative models of eligibility using real-world data. It draws on information about adverse events generated from a representative survey of public hospital admissions in New Zealand and classifies these under a range of eligibility criteria for different possible compensation systems. These are then evaluated according to a number of policy design considerations, using variables available from the New Zealand study.

Across virtually all jurisdictions, preventability – be it practitioner error under tort or generic avoidability in the Nordic model – played a crucial role as a grounds for compensation. Only the expanded New Zealand scheme fundamentally challenges this principle since it will accept almost all adverse events as potentially compensable. The modelling exercise showed that the preventability criterion also taps events associated both with patient dissatisfaction and with quality issues of systemic importance.

On this design principle tort had institutional advantages since it responds to a well-defined subset of preventable events. Tort was also better (if narrowly) targeted, since the modelling demonstrated that a high proportion of compensable cases under tort would be severe, highly preventable, and system-related, while in the schemes with broader coverage, eligible events would necessarily be more diverse.

Severity remained an important design principle, however. Again, in virtually all jurisdictions it was a threshold criterion, either de facto or formally specified. Also, it plays a
role in the award of damages, and, more broadly, societies respond to the impact of long-term disability. On this criterion the modelling exercise showed that tort performed poorly, since it would have denied the opportunity for restitution to two thirds of hospital patients seriously harmed by an adverse event.

A final area of focus was the distributional impact of compensation systems. Although tort was the least generous - covering less than a fifth of events - all six models provided cover without apparent discrimination. Furthermore, although the probability of suffering a compensable event subsequent to hospital admission tended to be higher for older patients and for Maori (the indigenous people of New Zealand), this pattern was the same for all schemes.

It is concluded that eligibility criteria can be only one dimension in any rounded assessment of compensation systems. Aside from no-fault’s provision of a funded, administrative alternative to awards won through court proceedings, wider institutional features need to be taken into account. These include the availability under different welfare state regimes of entitlements to publicly-funded care and income maintenance, as well as the provision of alternative dispute proceedings, such as the Health and Disability Commissioner in New Zealand. While the wholesale transfer of such arrangements may be unlikely, it is still possible to draw lessons cross-nationally for institutional design.

**Key Words:** treatment injury; compensation; no fault; institutional design; modelling
Introduction

Background

There is growing interest in alternatives to negligence liability for treatment injury (Bovbjerg and Sloan 1998; Studdert and Brennan 2001b). This applies across funding systems, with the level of liability insurance premiums being a recurrent issue for practitioners in the United States (Charatan 2002), and a white paper published on the reform of the clinical negligence compensation system in the National Health Service in the United Kingdom (Chief Medical Officer 2003). Similar concerns have been expressed in Australia (Zin 2002).

To date, the principal focus of research on treatment injury has been in describing its epidemiology (Brennan et al. 1991; Wilson et al. 1995; Thomas et al. 2000; Vincent, Neale and Woloshynowycz 2001; Schioler et al. 2001; Baker et al. 2004). Less attention has been given to the issue of patient compensation, though much of the research was initially prompted by concern over trends in clinical negligence litigation (Hiatt et al. 1989). Moving the epidemiological and research focus from documenting treatment injury to assessing patient compensation raises broader questions about the regulatory framework, bringing into relief the relative merits of tort and "no-fault" legal systems (for example, financial implications of different systems of patient compensation for treatment injury (Studdert et al. 1997)).

The principal motivation for introducing no-fault legal systems has been to ease the path of compensation and reduce the burden of litigation (Bovbjerg and Sloan 1998). Such systems are also judged to have the potential to assist quality improvement activities by encouraging the disclosure and discussion of error free of the fear of litigation (Gostin 2000). Against this has to be weighed the possibility that the lack of an adequate legal “deterrent” may foster sub-standard practice (Bovbjerg and Sloan 1998), and that such schemes may prove to be costly (Studdert et
al. 1997). It is also not clear the extent to which no-fault systems may assist in encouraging quality improvement by insulating "medical error" from wider medico-legal sanction (Davis et al. 2002b; 2003).

Some analytical issues

It is possible, very broadly, to identify three approaches to medical injury in the literature; these draw on clinical epidemiology, medicine and the law, and health management, respectively. For the first there has, since the Harvard Medical Practice Study, been a strong representation of epidemiological studies with a medico-legal orientation that have focused on measuring the occurrence of medical injury and assessing its clinical context (for example, Thomas and Peterson 2003). In the second case, there is a predominantly medico-legal literature that has considered the regulatory environment, with an emphasis on the tort system and its possible reform (for example, Sage 2004). This literature has also considered questions of compensation. Finally, there is a managerial and professional thrust towards evidence-based medicine and quality improvement, with advocates dedicated to developing and implementing measures for the reduction of waste and patient harm (for example, Tamuz et al. 2004).

A fourth approach that is not well integrated with epidemiological, medico-legal and management perspectives is health and policy sociology. From this perspective issues of institutional context and design are key considerations (Sage 2003). Thus, in the analysis of the societal response to treatment injury and patient harm, there are three arenas of institutional focus – adjudication (via the courts), self-regulation through the profession, and investigation for operational purposes by management. Societies have traditionally worked with these three institutional building blocks to construct different policy frameworks for handling the
fundamental issues that surround patient harm (Allsop and Mulcahy 1996). These fundamental concerns are: how was the harm caused and should someone be held accountable? (responsibility); how is demonstrated harm to be compensated and put right? (restitution); and, are there any lessons to be learned so that this harm can be prevented in future? (recurrence).

Table 1 presents these basic issues of societal concern schematically against the three key institutional elements of policy design identified above, with illustrative material in the body of the table. In the case of tort, for example, all three issues are fused together in the legal process. This is both its strength and its weakness. In the case of no-fault jurisdictions there is room for a degree of institutional separation, such that the attribution of responsibility – which may be conducted through standard professional or other disciplinary and complaints procedures - is de-linked from restitution (rehabilitation and compensation) and the issue of addressing recurrence (a management function, although with major professional and regulatory contributions) (Studdert and Brennan 2001a).

**TABLE 1 ABOUT HERE**

**No fault – the New Zealand case**

Although no-fault systems of patient compensation have exerted a considerable fascination for policy makers and professional leaders (Horwitz and Brennan 1995; Petersen 1995), few jurisdictions have embarked on such a major departure from the tort tradition (Brahams 1998). Among those that have are a group of Nordic countries and New Zealand, where, since 1972, an Accident Compensation Corporation has compensated medical misadventure (and other forms of
accidents) through a public insurance scheme without the need for litigation to establish fault (Miller 1993).

Two categories of medical misadventure are eligible for compensation – "error" and "mishap". Error is defined either as a lack of a standard of care and skill reasonably to be expected in the circumstances, or a negligent failure to diagnose correctly or provide treatment, or a negligent failure to obtain informed consent. Mishap is a rare and severe adverse outcome of treatment properly given, with rarity defined as an outcome expected in less than one per cent of cases, and severity as either death, at least 14 days in hospital, or a significant disability lasting longer than 28 days (Davis et al. 2002a).¹

In one important respect the New Zealand scheme is a system hybrid since it contains these two distinct grounds for compensation claims. Thus, presented at a more conceptual level, the New Zealand scheme accepts two distinct sets of criteria. The first set is associated with the cause of an injury; in essence, regardless of severity of impact on the patient, claims are judged as to whether or not the injury was preventable in the hands of a professional. According to the second set, by contrast, it is the impact of treatment injury that is important; that is, a judgement is required as to the severity of harm suffered by the injured patient, regardless of cause (albeit subject to a rarity criterion).

In Table 2 these two dimensions of eligibility are displayed in such a way as to describe three major system types for medical injury compensation, together with a modified variant in each case. These major types are: tort, the New Zealand version of no fault,² and the Nordic model.³ The Nordic system demonstrates a relatively concerted commitment to preventability as the dominant criterion, while under tort a sub-set of preventable acts are targeted (those of health professionals). At the other extreme is a modified version of the New Zealand scheme under
which nearly all unintended injury would be compensated, regardless of preventability. The current New Zealand scheme, as a system hybrid, combines two cells.\textsuperscript{4}

**TABLE 2 ABOUT HERE**

**Assessing treatment injury compensation systems**

The New Zealand system has been under review and various options for the modification of its model of compensation have been canvassed (Dyson 2003), yet little is available to assist with this assessment. Therefore, the purpose of this analysis is, in the first instance, to contribute towards the evaluation of different potential types of compensation system - as defined in Table 2 - through the application of data on adverse events from a representative survey of admissions to New Zealand public hospitals in 1998.

For each of six model types we consider a number of criteria. In the first place we return to the areas of societal concern identified in Table 1 – responsibility, restitution, and recurrence – and consider relevant variables available in the data set. In the case of responsibility we might ask whether eligibility rules incorporate those patients who are both harmed and have a sense of grievance. For the principle of restitution, the analysis has suggested two dimensions of compensation - extent of patient injury inflicted, and preventability of harm caused – and therefore these are important criteria to be considered in model design. Finally, for recurrence, we might consider whether the system in question identifies cases that are important for quality improvement.

A second key consideration is the social impact of any model of compensation. While a model type might be assessed on purely technical criteria – how many patients, suffering which
kinds of harm, are in principle eligible for compensation? – another criterion would be
distributional effect. Thus, given that a model meets certain technical criteria, does it, in
compensating on these criteria, also tend to offer redress to one segment of the population more
than another? Again, we have available in the data set a number of social dimensions for such an
analysis; essentially, age group, gender, ethnic affiliation, and socio-economic status (as
represented by deprivation status of area of residence (Crampton et al. 1997)). These are
standard points of comparison in sociology and social epidemiology, and they also represent
areas of potential social vulnerability and disadvantage in health care delivery and in access to
redress.5

Finally, in weighing these criteria, we are also in a position to consider the inclusiveness
of any given model, as well as its efficiency. We have called these considerations “coverage”
and “targeting”, respectively. In essence, the first asks whether a particular eligibility
requirement would, in principle, seek out a high or low proportion of a potential criterion group
(for example, patients suffering serious harm). For the second, the question is not whether a high
proportion of a criterion group are eligible for compensation, but whether those qualifying are
drawn disproportionately from this group (such as the seriously injured). In all instances it
should be noted that, of necessity, the analysis cannot rule on whether or not claims are lodged,
and compensation received. The available data only permit categorisation of patients into classes
of event defined by eligibility criteria. In other words, these are categories of event that are
compensable in principle only. They address issues of eligibility; they do not guarantee a claim,
or its success.

METHODS
The data for this assessment are drawn from patient notes accessed through a representative survey of admissions to New Zealand public hospitals in 1998. Sampling strategy, data collection, and definition of variables are outlined below.

**Sampling strategy**

Medical records were drawn from a representative sample of 13 public hospitals selected from amongst 20 institutions with 100 or more beds. Sampling followed stratification by hospital type and geographical area across New Zealand. The national sample comprised: (1) all 6 large tertiary service facilities; (2) a probability proportional to size (PPS) sample of 4 smaller secondary service facilities with more than 300 beds; (3) a PPS sample of 3 secondary service facilities with fewer than 300 beds.

The survey population was defined as all patient admissions for calendar year 1998 (excluding day, psychiatric, and rehabilitation-only cases). The sampling frame for each hospital was a list of all eligible admissions in that hospital. The New Zealand Health Information Service (1998) selected a systematic list sample of 575 admissions from each of these hospitals for the year 1998, with cases ordered by admission date. The medical record associated with each of 6,579 sampled admissions was analysed for the occurrence of an adverse event. This was taken as the study measure of iatrogenic injury (Davis et al. 2001).

**Data collection**

The core data collection procedure of the study was a two-stage retrospective review of a representative sample of medical records from each selected hospital, using instruments closely
modelled on those in similar American and Australian studies (Brennan et al. 1991; Wilson et al. 1995).6

The first stage was a screen (RF1) undertaken by specifically trained registered nurses. The purpose of this stage was to ascertain if the hospitalisation in question - the sampled admission - met any of 18 screening criteria selected as potentially indicative of an adverse event. The second stage, undertaken by experienced physicians trained for the task, used an instrument (RF2) relying on structured implicit review (that is, the guided exercise of professional judgement). The objective of this exercise was to determine whether the sampled admission was associated with an adverse event and, if so, to characterise it according to key clinical and other criteria (for example, compensability and preventability) (Davis et al. 2001).

Definition of variables

*Adverse events*. To qualify as an adverse event for this analysis, an incident had to: have occurred inside a public hospital before or during the sampled admission; been recorded by a health care professional during the sampled admission; and, later assessed as an adverse event by a study physician reviewer. An adverse event was operationally defined as an unintended injury resulting in disability, and judged with at least a moderate degree of certainty - more likely than not – to be caused by health care management rather than by the underlying disease process.7

*Preventability* of an adverse event was assessed as an error in health care management due to failure to follow accepted practice at an individual or system level.

*Scheme compensation criteria*. Adverse events were judged by study reviewers according to the New Zealand statutory criteria for medical misadventure (i.e. medical error and medical mishap, as set out above).8
Patient dissatisfaction. Two measures were available from the medical record,\(^9\) based on the following questions to study nurses or physicians:

- “Patient / family dissatisfaction with care documented in the medical record and / or evidence of complaint lodged.” (Nurse screener - RF1)
- “Documentation or correspondence indicating litigation, either contemplated or actual.” (Nurse screener - RF1)

System significance. Adverse events judged by study reviewers as indicating “system failure”. This included: defective equipment or supplies; equipment or supplies not available; inadequate reporting or communication; inadequate training or supervision of doctors/other personnel; delay in provision or scheduling of services; inadequate staffing; inadequate functioning of hospital services; and, no protocol or failure to implement a protocol or plan. These events are judged to raise major, systemic quality issues.

The six different system types as defined conceptually in Table 2 were operationalised using available study variables and assessments. These study definitions are outlined in Table 3.

**TABLE 3 ABOUT HERE**

Statistical Analysis

Percentages were estimated to take account of the complex sampling scheme and thus may not correspond to the actual numbers of cases cited.

Multiple logistic regression was used to determine the contribution of patient factors to predicting binary outcomes - that is, compensability of adverse events - under different compensation regimes. Compensable events were compared to the constant set of hospital
admissions that were defined by the study as not being adverse events. Patient factors were age (30-64 years, 65 years and over, reference = 0-29 years), gender (male, reference = female), ethnicity (Maori (the indigenous people), reference = non-Maori), and area deprivation score (deciles 6-10 (high deprivation), reference=deciles 1-5).

Odds ratios and standard errors were appropriately estimated taking into account sample design. The adjusted odds ratios show the impact of each patient factor on the outcomes, controlling for the effects of all other variables in the model. The odds ratio can be interpreted as the likelihood of experiencing a compensable event given a particular patient characteristic (for example, being older).

Cross-model differences in odds ratios for particular patient factors were tested by comparing other models in turn to the “modified New Zealand system” model (adopted as the benchmark since it considers all adverse events to be eligible for compensation). The jackknife method was used, since it accounts for variability in both estimates (Lohr 1999), and the resulting t-score was then tested for significance. For each patient factor this technique was used to calculate the standard error for the difference between the respective estimates associated with the two models being compared.

RESULTS

In Table 4 the different compensation systems are presented according to the various criteria of coverage, i.e. inclusiveness. In the first data column the occurrence rate of compensable events is presented. Under “Restitution” the data address coverage for severe events and for events which are highly preventable. Results on coverage for events prompting patient dissatisfaction and for system-related events are in the remaining two columns.
With the modified (i.e. expanded) New Zealand system, just under eight per cent of hospital admissions would result in a potentially compensable event. The next most generous system is the Nordic model. Tort and the current New Zealand systems are among the least generous, together with the modified versions of Nordic and tort. This profile generally holds across the dimensions of consideration, with the expanded New Zealand system being the most comprehensive, followed by the Nordic model, with tort having the lowest levels of coverage (together with the modified versions of tort and Nordic, on all dimensions except severity). It should be noted that, on these data, tort would in principle cover only a third of serious harm suffered by patients and just about a half of all highly preventable events. The modified tort model would, on all these dimensions except severity, record even lower levels of compensability.

Table 5 presents results on the same dimensions for the targeting – i.e. efficiency - of eligibility for compensation. The profiles from the previous table are just about reversed. Thus, nearly all events that are in principle compensable under tort would, on these data, be highly preventable. Also, over two-fifths of these same events would be associated with serious harm caused to patients, and nearly two-thirds of these events would be ones that would need addressing for quality improvement. By contrast, only a little over a quarter of compensable events under the expanded New Zealand system would be characterised by serious harm, just over a third would be highly preventable, and under a third would be system-related. The profiles for the current New Zealand system and for the Nordic model cluster around the pattern...
for tort. Imposing a severity threshold on the Nordic and tort models would make them much more highly targeted.

**TABLE 5 ABOUT HERE**

Finally, the issue of distributional effects is addressed in Tables 6 and 7. In Table 6 we restrict our analysis to the occurrence of compensable events. In essence we wish to consider whether or not there is the same level of compensability within each scheme across our indicator social groups. The first data column displays the proportion of adverse events eligible for compensation under different schemes. This varies from 100 per cent of adverse events for the expanded New Zealand scheme, to just under a fifth of such events for tort and modified Nordic, and under ten per cent for modified tort. The remaining columns consider the proportion of adverse events in principle eligible for compensation for four indicator groups: those over 65 years of age, females, Maori, and those living in highly deprived areas. What the data show is that the proportion of eligible events identified in the first column carries across for each social group. In other words, the same degree of generosity in eligibility for compensation – or lack of it in the case of modified tort – is more or less replicated across all social groups (except for Maori, who almost consistently experience the lowest levels of compensability across schemes).

**TABLE 6 ABOUT HERE**

In Table 7 multiple logistic regression analysis is used to assess the socio-demographic patterning of different sets of adverse events defined according to their compensability under the
range of policy models outlined in Table 2. Under all models of compensation there was a higher likelihood of experiencing a compensable event both for older patients and, although less strongly, for those of Maori ethnicity. There were no significant differences for gender or for social deprivation. In summary, under all models older patients and those of Maori ethnicity would run a higher risk of compensable harm.\textsuperscript{11}

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\section*{Discussion}

\textbf{Key findings – a summary}

Three broad systems of compensation can be identified using eligibility criteria, respectively, of preventability of harm (Nordic), practitioner error (tort), and treatment injury (New Zealand no fault). How do these different systems of compensation rate on performance of their institutional responsibilities (responsibility, restitution, recurrence) and on key design criteria (coverage, targeting, and social impact)? This has been the purpose of this analysis using data on adverse events for admissions to New Zealand public hospitals in 1998.

On these data the current New Zealand scheme, and tort, both ranked low on levels of eligibility, with an occurrence rate of fewer than two compensable events per 100 hospital admissions, and correspondingly fewer adverse events covered on study measures of restitution, responsibility and recurrence. The expanded New Zealand scheme, by contrast, recorded an occurrence rate of nearly eight compensable events per 100 hospital admissions and covered all events that were severe, highly preventable, system-related, or involved recorded patient
dissatisfaction. The Nordic system ranked mid-way. Placing severity thresholds on tort and Nordic systems sharply reduced coverage on all criteria (except severity) (Table 4).

On the targeted nature of the systems, the positions were reversed. Low proportions – generally a third or less - of events eligible for compensation under the expanded New Zealand system met study measures of performance. For tort these proportions were much higher – generally a half or more – with the Nordic system in between. The modified tort and Nordic systems were also more highly targeted on most dimensions (Table 5).

The distributional effects of the different compensation systems were judged on both univariate and multivariate analyses (Tables 6 and 7). In neither case was there evidence of any marked or consistent discriminatory impact of any system, although Maori tended to be disadvantaged across all schemes.

Key findings – interpretation and implications

In all three system types preventability played a central role in the determination of compensation – practitioner error for tort, preventability of harm in the Nordic model, and medical error as one of two categories in the current New Zealand system. Clearly, establishing the grounds on which harm should be compensated almost universally requires demonstrating, not just injury was incurred, but some lapse from accepted standards of care. This is the fundamental sense of “just cause” that runs through all the systems, and is only fundamentally challenged in the new and expanded version of the New Zealand scheme which will, in principle, cover all adverse events (Braddell 2005).

There is a reflection of this in the results reported from the modelling exercise (Table 4). Thus, of the adverse events for which patient complaint or litigation was recorded, and excluding
the expanded New Zealand scheme (which covers all events), the highest proportion that also qualified for compensation, did so under the preventability-based Nordic model – two thirds compared with about a third for tort and current New Zealand. In other words, preventability as a basis for social concern – for example, fuelling patient dissatisfaction – goes well beyond practitioner error (as under tort) and encompasses a broader interpretation of avoidable lapses in standards of care.

It is also noteworthy that the highest proportion of recorded system events was accounted for under the Nordic scheme; nearly all qualified, in comparison with less than half under tort and the current New Zealand (Table 4). Thus, preventability as a criterion serves as potential grounds for compensation, it taps patient dissatisfaction, and it identifies nearly all events that have system-related etiologies.12

Nevertheless, studies have shown that severity of harm carries weight. Juries can be swayed by the extent of disability of harm suffered by a plaintiff more than by the niceties of whether or not practitioner error is implicated (Brennan et al. 1996).13 Furthermore, birth injury is one of the most extensively litigated and compensated claims, suggesting that the prospect of a lifetime of care and support is at least a consideration when parents lodge claims or enter proceedings for such events.14 It is also the case that most, if not all, no-fault systems apply some kind of severity threshold (ACC 2002). Therefore, if we take severity seriously as a potential criterion for compensation – if not for eligibility, then for the scale of award – then the results of this study show that tort fares poorly. Of those adverse events that were associated either with death, or at least 14 days in hospital, or significant disability of 28 days or more, tort would have covered only a third (i.e. those due to practitioner error).15 Only the expanded New Zealand
scheme would have covered them all, with the Nordic dealing with two thirds and the current New Zealand under half (Table 4).

On the other hand, tort showed that it is well targeted, with a high proportion of eligible cases being severe, highly preventable and system-related, all desirable qualities when considering where judicial, professional and managerial resources should be concentrated in responding to patient harm (Table 5).\textsuperscript{16}

The major criticism of tort has been on its potential for social unfairness (i.e. only those able to outlast the gruelling litigation process succeed). However, this applies principally to the process of claiming and to the barriers presented by the demands of litigation. When judged according to eligibility for compensation, there was remarkably little difference between social groups in the proportion of adverse events judged compensable within each system type. Nevertheless, at a fifth of adverse events, tort coverage was among the lowest. Modified tort – applying a severity threshold – would cut coverage to less than ten per cent. Therefore, tort, like the other systems under consideration, did not operate in a discriminatory manner, but its coverage was low.

**Strengths and limitations**

The methodological strength of the study is its claim to represent hospital practice in a well-established no-fault jurisdiction. The data equated to a one per cent sample of admissions to New Zealand public hospitals in 1998, and its profile on most key demographic and health criteria matched those of the wider hospital population for that year (Davis et al. 2001). The analytical strength of the study has been its ability to configure basic epidemiological and survey data into
an assessment of the possible impact of a range of models of compensation using various institutional design criteria, including coverage and targeting.

Limitations of studies of this kind are well known. In particular, there are questions about the reproducibility of judgements on medical injury when these are reliant solely on structured implicit review (Thomas, Studdert and Brennan 2002). Yet, while levels of agreement of reviewer judgements were moderate in this study - 87.5% agreement (kappa 0.47) with an expert reviewer on adverse event determination for a 1 in 10 sub-sample of cases17 - these were within norms for international studies of this kind (Davis et al. 2001).

A second set of issues concerns the role of medical records as a data source. It is clear that these may be a partial and possibly selective account of adverse events, with alternative sources in observation (Andrews et al. 1997) and voluntary reporting (O'Neil et al. 1993). Yet Brennan et al. (1990), in an earlier study of litigation and quality assurance at two teaching hospitals, concluded that, using the litigation and risk management records as a criterion, the overwhelming majority of adverse events and episodes of negligent care were discoverable with medical record review.

Thirdly, the adverse events model of investigation was originally designed for injury rather than compensability. Although in the current study the model was adapted to assess criteria under the New Zealand scheme, it does not provide the nuances of information required to specify criteria such as avoidability or endurability (under Nordic systems (ACC 2002)). The models as operationalised, therefore, are approximate only and heuristic in purpose. Furthermore, the study is unable to determine whether events thought to qualify under New Zealand scheme criteria would have been accepted as such by the public insurer. Nevertheless, an earlier pilot study on claims lodged with the Accident Compensation Corporation is relatively
reassuring, with a kappa of 0.66 between study and official assessments (Davis et al. 2002a). However, the study cannot determine whether such events did indeed progress to a claim under medical misadventure and, if so, whether or not they were successful.

Finally, it should be noted that this analysis has been based on a modelling exercise using existing data. It needs to be conceded, firstly, that the variables used to measure various design criteria are themselves approximations. Also, the operationalisations of the three systems – and their modified variants – are all dependent on data originally generated for another purpose (namely, an audit study of adverse events). Furthermore, these scenarios were developed around the putative eligibility criteria of different schemes, and as such say nothing about rates of claim or claim outcomes nor about wider institutional features of these systems and their context (such as the impact of an alternative judicial office in the New Zealand scheme (designed to deal with complaints) or the potential effects on settlements of the more comprehensive income maintenance and health care regimes available in most developed welfare states).

**Controversies and directions**

There is now a generation of studies on the epidemiology of adverse events in hospital settings (Brennan et al. 1991; Wilson et al. 1995; Thomas et al. 2000; Vincent, Neale and Woloshynowych 2001; Schioler et al. 2001; Baker et al. 2004). To date, however, these have been carried out mainly in orthodox tort jurisdictions and have, with rare exceptions, not canvassed alternative compensation systems. This study is the first carried out in a well-established no-fault system of patient compensation. Thus, earlier studies have centred on negligence as the key medico-legal concept (Hiatt et al. 1989), while the current investigation has been able to extend this singular focus - drawn from tort law - into a consideration two
distinct sets of compensation eligibility criteria that can be "unpacked" from the New Zealand system and reshaped to simulate three compensation regime types.

While the analysis brings issues of system design to the fore and gives prominence to the no-fault principle, the empirical exercise reported here has done little more than model these eligibility criteria under three major system types against various measures of performance. One does not get a sense here of how the eligibility rules of a particular system articulate with wider institutional arrangements. For example, the average settlement under the current New Zealand system is about US$12,500 (ACC 2003). To the international observer this seems an extraordinarily low figure in comparison with awards made under tort. There may be a number of reasons for this, but one relates to the institutional context; thus, in a publicly-funded hospital system it is likely that much repair and rehabilitation work would be conducted within the normal workload under standard professional obligations of a duty of care and so would not fall as a cost on the compensation system (Davis et al. 2002a). ¹⁸

Therefore, any fully rounded assessment of compensation systems needs to consider the institutional context. In the case of the emerging New Zealand system a key feature of this institutional context, aside from a universal accident insurance scheme, is both a largely publicly-funded health care system and a comprehensive complaints framework grounded in a code of patient rights (Paterson 2002). ¹⁹ These are features of a unique historical trajectory that cannot easily be translated to other cultural contexts or captured in an empirical modelling exercise of eligibility criteria.

To the extent that there are aggregate data addressing significant outcomes of the New Zealand system, it appears that the proportion of compensable events resulting in successful claims may not be noticeably different from that under tort (Davis et al. 2002a), and the level of
serious, preventable harm is also much the same (Davis et al. 2003). In other words, there is no convincing evidence that the New Zealand system achieves higher levels of claim or more opportunities for prevention (even though overall it seems a fairer and more cost-effective system and involves health personnel in fewer, and less gruelling, legal proceedings\textsuperscript{20}). This seems to be the case despite an institutional framework that would appear to be set fare to produce just such desirable outcomes.

**CONCLUSION**

Virtually all current systems established to deal with claims for treatment injury rely on criteria of preventability and/or severity of harm to determine compensability. The new and expanded New Zealand system challenges this consensus since it will recognise practically all adverse events as grounds for claim. This brings it into closer conformity with the universalist sweep of the comprehensive personal injury scheme of which it is a part, but sets it aside from most schemes internationally. Given the historically low level of claiming and settlement, however, the New Zealand scheme will, despite this considerable expansion, probably remain a highly cost-effective one. Furthermore, with the removal of fault finding from the eligibility criteria underpinning the scheme, and with the growing independence and stature of the Office of the Health and Disability Commissioner, this development in the New Zealand system can be seen as a further evolution in the institutional separation of the function of compensating treatment injury on the one hand, from the regulatory activities of judicial, professional and management agencies dealing with patient harm and quality issues on the other.
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Table 1. Institutional arena and area of concern - tort

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<thead>
<tr>
<th>Areas of Societal Concern</th>
<th>Institutional Arena</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The Courts – adjudication</td>
</tr>
<tr>
<td></td>
<td>The Profession – self-regulation</td>
</tr>
<tr>
<td></td>
<td>The Managers – investigation</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Finding fault</td>
</tr>
<tr>
<td>Restitution</td>
<td>Financial awards</td>
</tr>
<tr>
<td>Recurrence</td>
<td>Requesting change</td>
</tr>
<tr>
<td></td>
<td>Discipline</td>
</tr>
<tr>
<td></td>
<td>Apology, costs</td>
</tr>
<tr>
<td></td>
<td>Treatment, apology</td>
</tr>
<tr>
<td></td>
<td>Training, guidelines</td>
</tr>
<tr>
<td></td>
<td>Quality gains</td>
</tr>
</tbody>
</table>
Table 2. Compensation systems: extent of harm by preventability

<table>
<thead>
<tr>
<th>Extent of harm inflicted</th>
<th>Preventability of harm caused</th>
<th>Any preventable</th>
<th>Practitioner error</th>
<th>All events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe harm</td>
<td>Modified Nordic</td>
<td>Modified tort</td>
<td>NZL (b)*</td>
<td></td>
</tr>
<tr>
<td>Any harm</td>
<td>Nordic</td>
<td>Tort, NZL (a)</td>
<td>Modified NZL†</td>
<td></td>
</tr>
</tbody>
</table>

NZL = New Zealand.

* Under current arrangements this category – medical mishap – must also satisfy a rarity criterion.

† Due to replace the current New Zealand scheme on July 1 2005.
<table>
<thead>
<tr>
<th>Scheme criteria</th>
<th>Model type</th>
<th>Study definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any preventable cause</td>
<td>Nordic</td>
<td>Adverse events with any evidence of preventability.</td>
</tr>
<tr>
<td>Severe preventable cause</td>
<td>Modified Nordic</td>
<td>Adverse events with any evidence of preventability – severe* cases.</td>
</tr>
<tr>
<td>Practitioner error</td>
<td>Tort</td>
<td>Medical error† (defined by New Zealand scheme criteria)</td>
</tr>
<tr>
<td>Severe practitioner error</td>
<td>Modified tort</td>
<td>Medical error† - severe* cases (New Zealand scheme criteria)</td>
</tr>
<tr>
<td>Error or severe harm</td>
<td>Current New Zealand</td>
<td>Either error† or mishap††, under New Zealand scheme criteria.</td>
</tr>
<tr>
<td>Any harm</td>
<td>Modified New Zealand</td>
<td>All adverse events qualifying according to study protocol</td>
</tr>
</tbody>
</table>

* Severity defined according to New Zealand compensation criteria as either death, at least 14 days in hospital, or a significant disability lasting longer than 28 days.

† Criteria for medical error under the New Zealand scheme are: either lack of standard of care and skill reasonably to be expected in the circumstances, or negligent failure to diagnose correctly or provide treatment or obtain informed consent.

†† Criteria for medical mishap under New Zealand scheme are: Severity, defined as being either death, at least 14 days in hospital, or a significant disability lasting longer than 28 days. Rarity defined as an outcome expected in less than one per cent of cases.
Table 4. Coverage – levels of compensability predicted under different systems for hospital admissions, and for events that are severe, highly preventable, subject to complaint or litigation, and system-related

<table>
<thead>
<tr>
<th>Compensation System</th>
<th>Occurrence*</th>
<th>Restitution</th>
<th>Responsibility</th>
<th>Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% hospital admissions (n=6579)</td>
<td>% all severe events† (n=143)</td>
<td>% all highly preventable events†† (n=193)</td>
<td>% all complaint‡, litigation¶ (n=40)</td>
</tr>
<tr>
<td>Nordic</td>
<td>4.69</td>
<td>64.9</td>
<td>100.0</td>
<td>57.6</td>
</tr>
<tr>
<td>Modified Nordic</td>
<td>1.41</td>
<td>64.9</td>
<td>32.3</td>
<td>30.9</td>
</tr>
<tr>
<td>Tort</td>
<td>1.54</td>
<td>30.1</td>
<td>51.2</td>
<td>28.6</td>
</tr>
<tr>
<td>Modified Tort</td>
<td>0.66</td>
<td>30.1</td>
<td>21.6</td>
<td>19.8</td>
</tr>
<tr>
<td>Current NZL</td>
<td>1.94</td>
<td>48.4</td>
<td>52.8</td>
<td>35.2</td>
</tr>
<tr>
<td>Modified NZL</td>
<td>7.82</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

NZL = New Zealand.

* In-hospital adverse events, rate per 100 admissions. Compensability assigned according to study definitions identified in column two. In-hospital adverse event defined as: (1) an incident recorded by a health care professional during the sampled admission and later assessed as an adverse event by a study physician reviewer; (2) ‘more likely than not’ due to health care management causation; (3) occurred inside a public hospital.

† Events associated with severity, defined by New Zealand scheme criteria (either death, at least 14 days in hospital, or a significant disability lasting longer than 28 days).

†† Events judged highly preventable by study reviewers (> 50:50 preventable).

‡ Complaint study question: “Patient / family dissatisfaction with care documented in the medical record and / or evidence of complaint lodged.”

¶ Litigation study question: “Documentation or correspondence indicating litigation, either contemplated or actual.”
§ System-related: defective equipment or supplies; equipment or supplies not available; inadequate reporting or communication; inadequate training or supervision of doctors/other personnel; delay in provision or scheduling of services; inadequate staffing; inadequate functioning of hospital services; no protocol / failure to implement protocol or plan; other.
Table 5. Targeting - proportion of compensable events predicted under different systems to be severe, highly preventable, subject to complaint or litigation, and system-related

<table>
<thead>
<tr>
<th>Compensation System</th>
<th>Restitution</th>
<th>Responsibility</th>
<th>Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% events</td>
<td>% events - highly preventable†</td>
<td>% events - complaint‡, litigation¶</td>
</tr>
<tr>
<td>Nordic (n=308)</td>
<td>30.2</td>
<td>62.4</td>
<td>8.0</td>
</tr>
<tr>
<td>Modified Nordic (n=94)</td>
<td>100.0</td>
<td>66.8</td>
<td>14.2</td>
</tr>
<tr>
<td>Tort (n=102)</td>
<td>42.6</td>
<td>97.3</td>
<td>12.1</td>
</tr>
<tr>
<td>Modified Tort (n=43)</td>
<td>100.0</td>
<td>96.3</td>
<td>19.7</td>
</tr>
<tr>
<td>Current NZL (n=129)</td>
<td>54.4</td>
<td>79.6</td>
<td>11.8</td>
</tr>
<tr>
<td>Modified NZL (n=142)</td>
<td>27.9</td>
<td>37.4</td>
<td>8.3</td>
</tr>
</tbody>
</table>

NZL = New Zealand.

* Events associated with severity, defined by New Zealand scheme criteria (either death, at least 14 days in hospital, or a significant disability lasting longer than 28 days).

† Events judged highly preventable by study reviewers (> 50:50 preventable).

‡ Complaint study question: “Patient / family dissatisfaction with care documented in the medical record and / or evidence of complaint lodged.”

¶ Litigation study question: “Documentation or correspondence indicating litigation, either contemplated or actual.”

§ System-related: defective equipment or supplies; equipment or supplies not available; inadequate reporting or communication; inadequate training or supervision of doctors/other personnel; delay in provision or scheduling of services; inadequate staffing; inadequate functioning of hospital services; no protocol / failure to implement protocol or plan; other.
Table 6. Distributional impact of coverage rules– proportion of adverse events deemed compensable, for indicator social groups

<table>
<thead>
<tr>
<th>Compensation System</th>
<th>% of all events (n=509)</th>
<th>% of all events among 65+ (n=201)</th>
<th>% of all events among females (n=277)</th>
<th>% of all events among Maori* (n=94)</th>
<th>% of all events among high deprivation† (n=323)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordic</td>
<td>59.9</td>
<td>60.0</td>
<td>61.1</td>
<td>57.1</td>
<td>59.5</td>
</tr>
<tr>
<td>Modified Nordic</td>
<td>18.1</td>
<td>20.0</td>
<td>17.6</td>
<td>11.2</td>
<td>17.3</td>
</tr>
<tr>
<td>Tort</td>
<td>19.7</td>
<td>21.9</td>
<td>20.6</td>
<td>18.4</td>
<td>19.5</td>
</tr>
<tr>
<td>Modified Tort</td>
<td>8.4</td>
<td>8.8</td>
<td>6.9</td>
<td>7.9</td>
<td>7.2</td>
</tr>
<tr>
<td>Current NZL</td>
<td>24.8</td>
<td>27.0</td>
<td>25.8</td>
<td>22.6</td>
<td>26.2</td>
</tr>
<tr>
<td>Modified NZL</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

NZL = New Zealand

* The indigenous people.

† NZDep96 decile is an area-based index of social deprivation, derived from patient domicile code (Crampton et al.. 1997).
Table 7. Multivariate odds ratios of patient factors for association with compensable in-hospital adverse events†, under different systems

<table>
<thead>
<tr>
<th>Patient factors</th>
<th>Compensation system</th>
<th>Nordic</th>
<th>Modified Nordic</th>
<th>Tort</th>
<th>Modified Tort</th>
<th>Current NZL</th>
<th>Modified NZL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference is 0-29 years</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>30-64 years</td>
<td>2.09* §</td>
<td>3.09* §</td>
<td>2.32*</td>
<td>2.88*</td>
<td>2.29*</td>
<td>1.74*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.68-2.60)</td>
<td>(2.26-4.21)</td>
<td>(1.30-4.17)</td>
<td>(1.80-4.61)</td>
<td>(1.38-3.81)</td>
<td>(1.45-2.08)</td>
<td></td>
</tr>
<tr>
<td>65+ years</td>
<td>2.71*</td>
<td>3.84*</td>
<td>3.46*</td>
<td>3.58*</td>
<td>3.25*</td>
<td>2.41*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.10-3.48)</td>
<td>(2.28-6.46)</td>
<td>(1.99-6.03)</td>
<td>(1.55-8.25)</td>
<td>(2.25-4.71)</td>
<td>(2.03-2.87)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference is Female</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.94</td>
<td>1.03</td>
<td>0.89</td>
<td>1.48</td>
<td>0.89</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.82-1.07)</td>
<td>(0.57-1.86)</td>
<td>(0.67-1.17)</td>
<td>(0.71-3.06)</td>
<td>(0.69-1.15)</td>
<td>(0.87-1.13)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference is non-Maori</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Maori ‡</td>
<td>1.56*</td>
<td>1.01</td>
<td>1.63</td>
<td>1.78</td>
<td>1.48</td>
<td>1.61*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.22-1.99)</td>
<td>(0.64-1.60)</td>
<td>(0.97-2.73)</td>
<td>(0.91-3.51)</td>
<td>(0.90-2.45)</td>
<td>(1.32-1.97)</td>
<td></td>
</tr>
<tr>
<td>Area deprivation score ¶</td>
<td>Reference is Low (deciles 1-5)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>High (deciles 6-10)</td>
<td>1.04</td>
<td>0.98</td>
<td>1.00</td>
<td>0.69</td>
<td>1.23</td>
<td>1.04</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.83-1.30)</td>
<td>(0.71-1.35)</td>
<td>(0.60-1.67)</td>
<td>(0.32-1.50)</td>
<td>(0.77-1.95)</td>
<td>(0.81-1.34)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(N=305)</td>
<td>(N=94)</td>
<td>(N=102)</td>
<td>(N=43)</td>
<td>(N=129)</td>
<td>(N=505)</td>
<td></td>
</tr>
</tbody>
</table>

NZL = New Zealand.

AE = adverse event.

* p<0.05

† Incident recorded by health care professional during sampled admission and later assessed as adverse event by study physician reviewer; and ‘more likely than not’ due to health care management causation; and occurred inside a public hospital.
†† Odds ratios and confidence limits were estimated using multiple logistic regression, adjusted to account for the sample design, with all patient factors in the model. Each odds ratio is adjusted for the effect of the other patient factors.

‡ The indigenous people.

¶ NZDep96 decile is an area-based index of social deprivation, derived from patient domicile code (Crampton et al.. 1997).

§ Significantly different to ”modified New Zealand system” (p<=0.05).
A recent legislative amendment means that “medical error” can include organisational failure to observe a reasonable standard of care where the error cannot readily be attributed to a particular health professional (Coates 2002).

This system is unique because coverage for medical harm occurred under the aegis of a comprehensive, no-fault compensation programme covering all personal injury incurred by accident. In proposals that have been accepted by the New Zealand legislature and which will come into effect on July 1 2005, this feature of the scheme will be further strengthened. Under these provisions, harm suffered in a therapeutic context will be defined as treatment injury and addressed as a particular category of the generic compensation programme, without reference to the way the harm was caused or the extent of its severity (Braddell 2005). This is foreshadowed in the category “modified NZL” in Table 2.

The “Nordic” model is to a degree a conceptual one since the schemes in the constituent countries vary in some details. However, these are minor when set against both the overarching similarity of the schemes and their distinctiveness internationally. It should also be noted that most of these schemes apply some concept of rarity (unexpectedness) and severity of impact (ACC 2002). The modelling exercise, therefore, is to an extent heuristic, emphasising the overriding commitment to preventability as the base criterion for compensation in the Nordic model. Severity as a criterion is introduced in the modified variant.

Although it should be noted that for the entry designated “NZL (b)” only serious harm meeting a rarity criterion is eligible for compensation under existing arrangements in New Zealand.

For example, Studdert et al (2000b) demonstrate that under tort in the United States the elderly and the poor are particularly likely to be among those who suffer negligence but do not sue.
While the instruments and definitions used are almost exact replicates, it should be noted that outcomes have not been exactly uniform across the different studies. Those in the United States have generated rates of adverse events of less than five per cent, while the New Zealand and Australian investigations have produced rates above ten per cent. The European (Schioler et al. 2001; Vincent et al. 2001) and Canadian (Baker et al. 2004) results come in between. While some progress has been made in reconciling the contrasting outcomes from the American and Australian investigations (Runciman et al. 2000), this cross-national diversity should not be seen as undercutting the pertinence of the current modelling exercise the objective of which is to evaluate the relative merits of a range of possible compensation schemes within the limits of the data available for this purpose. While this exercise will assist the considered evaluation of different compensation scheme, it will not necessarily provide accurate estimates of likely rates of compensability in different national contexts.

One point to be emphasised is that not all adverse events are preventable. In the New Zealand study physician reviewers could not identify any element of preventability in about a third of all adverse events (Davis et al. 2001). This is not untypical in studies of this kind. Adverse outcomes still occur that could not have been foreseen or prevented, given our current state of clinical knowledge, particularly for technically complex procedures and for frail patients.

In the case of the technical definition of mishap under the New Zealand regulations, severity of impact has to pass a rarity threshold before a claim can qualify for compensation. For all applications in this paper, however, except where results are being presented for the current New Zealand scheme, the severity assessment alone is used, without a rarity threshold (which is only applied to the New Zealand case).
As one of our reviewers pointed out, there must be a good deal of scepticism as to whether data on patient dissatisfaction are fully recorded in the medical record. The levels registered in this study must, in the words of the reviewer, be regarded as setting a “lower bound”. Although it is possible that the rates of recording for such information are higher in the less litigious environment of New Zealand (see Davis et al. (2002b) for an argument along these lines), the absolute level of recording for patient dissatisfaction is not crucial to this analysis. It would obviously be desirable to have a high level of documentation for this important variable. However, the emphasis in this analysis is on the relative performance of different compensation schemes, within the bounds of the current data set. While the values recorded here cannot be extrapolated beyond this investigation, there are strong grounds for taking relativities seriously in any policy discussion.

This split was used to maximize sub-sample size. Other cut points were tested with similar results – bottom and top quintiles – but the small numbers reduce any confidence in extrapolating from such results.

The only cross-model differences – using the modified New Zealand model as the reference – were in the age group 30-64 for Nordic and modified Nordic. However, since we would expect one or two significant results by chance in 25 comparisons, too much should not be read into this. Also, these do not depart from the general pattern of older patients experiencing higher levels of compensable events – across all models.

See Fitzjohn and Studdert (2001) for an argument along these lines.

But see Taragin et al (1992) for a contrary finding.

This is an area where stand-alone no-fault systems have been established (Studdert et al. 2000a). Other such stand-alone areas have been harm associated with vaccination and with
pharmaceuticals (ACC 2002). In the New Zealand scheme five per cent of cases account for 60 per cent of programme costs, and these are principally birth-injury related (ACC 2003).

15 This is consistent with the rates of cover for medical injury more generally. Thus, in the Harvard Medical Practice Study only a quarter of adverse events were due to negligence (although the rate was higher among more severe injuries) (Brennan et al. 1991).

16 This is also provides the basis for the argument that the study of malpractice claims can provide insights into all these areas – legal, professional, and quality improvement (for example, Kravitz et al. (1991)).

17 After adverse event determination, sample size dropped to less than 850. At this point the 1 in 10 sub-sample was too small to assess measures of agreement on other key study variables, such as preventability.

18 Another aspect that is hard to quantify is the availability in developed welfare states of programmes of comprehensive income maintenance for demonstrated incapacity and disability. This might be assumed to reduce costs for no-fault schemes since long-term incapacity and disability might be covered under broader welfare state arrangements. However, there would seem to be just as many tort regimes that qualify under this rubric – for example, the United Kingdom and Australia – as there are no-fault systems (Nordic and New Zealand).

19 Although the Health and Disability Commissioner sits atop a semi-judicial complaints structure complete with a range of sanctions, including disciplinary proceedings, an important statutory function is education and prevention, and the current incumbent has done much to encourage a climate of open discussion and quality improvement around issues of patient harm (Paterson 2002).
In the latest report of the Health and Disability Commissioner, only 18 health practitioners were subject to disciplinary proceedings initiated by the Commissioner in 2003/04, only a minority of whom were medically qualified, from a workforce of approximately 8,000 physicians (HDC 2004).