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Identification of doctors at risk of recurrent complaints: a national study of healthcare complaints in Australia

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ABSTRACT

Objectives (1) To determine the distribution of formal patient complaints across Australia's medical workforce and (2) to identify characteristics of doctors at high risk of incurring recurrent complaints.

Methods We assembled a national sample of all 18 907 formal patient complaints filed against doctors with health service ombudsmen ('Commissions') in Australia over an 11-year period. We analysed the distribution of complaints among practicing doctors. We then used recurrent-event survival analysis to identify characteristics of doctors at high risk of recurrent complaints, and to estimate each individual doctor's risk of incurring future complaints.

Results The distribution of complaints among doctors was highly skewed: 3% of Australia's medical workforce accounted for 49% of complaints and 1% accounted for a quarter of complaints. Short-term risks of recurrence varied significantly among doctors: there was a strong dose-response relationship with number of previous complaints and significant differences by doctor specialty and sex. At the practitioner level, risks varied widely, from doctors with <10% risk of further complaints within 2 years to doctors with >80% risk.

Conclusions A small group of doctors accounts for half of all patient complaints lodged with Australian Commissions. It is feasible to predict which doctors are at high risk of incurring more complaints in the near future. Widespread use of this approach to identify high-risk doctors and target quality improvement efforts coupled with effective interventions, could help reduce adverse events and patient dissatisfaction in health systems.

INTRODUCTION

To many doctors who are sued or complained against, the event seems random. At the population level, however, there are patterns. Previous studies have compared doctors who experienced multiple malpractice claims,[1–5] complaints,[6 7] and disciplinary actions[8–10] with doctors who experienced few or none, and identified differences in the sex, age and specialty profile of the two groups. Such research helps to explain medico-legal risk retrospectively, but does not provide practical guidance for identifying risks prospectively. Clinical leaders, risk managers, liability insurers and regulators all lack reliable methods for systematically determining which doctors should be targeted for assistance and preventive action *before* they acquire troubling track records. Consequently, the medico-legal enterprise remains reactive, dealing primarily with the aftermath of adverse events and behaviours that lead to costly disputes.

The conventional wisdom is that future medico-legal events cannot be predicted at the doctor level with acceptable levels of accuracy.[11 12] Numerous studies have tried,[13–23] most with limited success. This body of research has two important shortcomings. First, only a few studies[15 17 21] report a method for predicting medico-legal risk that is potentially replicable, and these methods are statistically complex. The practical consequence is that regulators and liability insurers today have no clear way of estimating risk at the practitioner level, and doing so is not a standard part of risk management practice.

Second, no study to date has found a way to deal well with temporal aspects of risk, such as the evolving nature of doctors' medico-legal event histories, which can be crucial information in assembling a risk profile. Previous claims and complaints have been identified as an important predictor of future events, but only in analyses that specify this variable crudely—usually by 'freezing' a doctor's track record at a specific point to estimate a 'one-time' effect.[13 14 16 17 19 21 24 25] This approach is out of step with how claims and complaints are managed. The frontline challenges are to determine how a practitioner's risk profile changes over time as new information (including new events) comes to hand; when support or intervention measures to prevent further events are warranted; and how strong those measures should be. A risk prediction method that helped to address these questions would have considerable potential for boosting the contribution of medico-legal institutions to quality improvement.

We assembled a national sample of nearly 19 000 formal healthcare complaints lodged against doctors in Australia between 2000 and 2011. We then used a time-to-event method of analysis to determine characteristics of doctors poised to incur recurrent complaints, and to estimate each practitioner's risk of recurrence at specific time points. The study had two main goals: to identify predictors of complaint-prone doctors in Australia, and to develop a robust and useful method for forecasting medico-legal risk.

METHODS

Setting

Health service commissions (Commissions) are statutory agencies established in each of Australia's six states and two territories. Commissions have responsibility for receiving and resolving patient complaints about the quality of healthcare services. Patients or their advocates must initiate complaints in writing, but the process is free and legal representation is optional.[26]

Table 1 compares the jurisdiction and functions of Commissions to those of the two other agencies that handle medico-legal matters in Australia—civil courts and the Medical Board of Australia.

Outside of the clinic or hospital in which care is received, Commissions are the primary avenue of redress for patients dissatisfied with the quality of care they have received. Plaintiffs' lawyers in Australia will rarely take on cases unless they have first proceeded through Commission processes (although the vast majority of complaints do not become negligence claims). At least 10 other Organisation for Economic Co-operation and Development (OECD) countries—including Austria, Finland, Israel, New Zealand and the UK—have similar bodies.[27 28] In the UK, the closest analogue is the Parliamentary and Health Service Ombudsman.

Commissions in all Australian states and territories except South Australia participated in the study. These seven jurisdictions have 21 million residents and 90% of the nation's 88 000 registered doctors. The study was approved by the ethics committee at the University of Melbourne.

Data

Between May 2011 and February 2012 we collected data on-site at Commission offices in each participating state and territory. Complaints against doctors were identified by querying the Commissions' administrative data systems. The filing period of interest spanned 12 years and differed slightly by jurisdiction: 2000–2011 for the Australian Capital Territory, the Northern Territory, Queensland, Tasmania and Victoria; 2000–2010 for Western Australia; and 2006–2011 for New South Wales.

All Commissions record the names of persons and institutions that are the subject of complaints, as well as the filing date, the nature of the complaint, the type of health professional named and their practice location. Although all Commissions recorded doctors' clinical specialty, the quality of this variable was mixed. Doctors' age and sex were not routinely

Table 1 Jurisdiction and functions of key agencies with responsibility for medico-legal matters in Australia

	Civil courts	Health complaints commissions	Medical Board of Australia
Cases handled	▶ Negligence claims	▶ Patient complaints	▶ Conduct, competence, or health matters
Jurisdictional focus	▶ Substandard care causing patient harm	▶ Low-quality care ▶ Patient dissatisfaction with care	▶ Professional misconduct ▶ Performance or competence falling below professional standards ▶ Ill-health, substance misuse, or impairment
Procedures used	▶ Out-of-court negotiation ▶ Alternative forms of dispute resolution (eg, mediation, arbitration) ▶ Trials before judges	▶ Early resolution ▶ Conciliation ▶ Investigation	▶ Review of doctor's competence or health status ▶ Investigation ▶ Disciplinary charges
Remedies	▶ Monetary damages	▶ Communication (eg, facilitate apology or explanation) ▶ Restoration (eg, facilitate provision of further treatment, fee forgiveness, monetary settlement) ▶ Correction (eg, recommend system change)	▶ Correction (eg, requirement that practitioner undergo education, rehabilitation, monitoring etc) ▶ Sanction (eg, suspension or revocation of practice licence*)

*Typically, such sanctions are imposed by external administrative tribunals in proceedings initiated by the Medical Board of Australia.

collected. We therefore supplemented the Commissions' administrative data with data from another source.

AMPCo Direct, a subsidiary of the Australian Medical Association, maintains a comprehensive list of doctors in Australia, including information on their sex, date of birth, specialty and subspeciality, and practice location. We purchased the AMPCo Direct database and matched doctors listed in it to doctors named in the complaints databases. The matching method is described in an online supplementary appendix.

Variables

We coded specialty into 13 categories, based on those promulgated by the Medical Board of Australia.[29] Doctors' principal practice address was classified as urban or rural, based on the location of its postcode within a standard geographic classification system.[30] The nature of concerns raised in complaints was sorted into 20 broad 'issue' categories. Commissions run dispute resolution processes; they generally do not rule on the merit of complaints, nor make findings for or against parties, so it was not possible to include a variable indicating how meritorious complaints were.

Statistical analysis

Distributional analysis

We plotted the cumulative distribution of complaints among two populations of doctors: (1) all unique doctors named in complaints and (2) all practicing doctors in the seven jurisdictions under study (ie, regardless of whether they had been named in complaints). The size of this second population was based on the number of doctors in employment in 2006,[31] the median study year. Because certain classes of complaints do not name doctors individually (eg. complaints arising in public hospitals in several of the study jurisdictions), we adjusted the proportions in the distributional calculations to ensure the numerators (number of complaints) matched the denominators (size of the 'exposed' segment of the medical workforce). Details are provided in the online supplementary appendix.

Multivariable survival analysis

We used multivariable survival analysis to identify predictors of doctors' risks of recurrent complaints. Specifically, we used an Anderson–Gill model[32] in which the time-scale ran from time from first event (ie, a doctor's earliest complaint) and allowed each doctor in the sample to accrue multiple complaints over the period of observation. The outcome variable was the occurrence of a complaint against a doctor, conditional on the doctor having been named in an earlier complaint. The covariates were the number of prior complaints a doctor had experienced, jurisdiction, and the doctor's specialty, age, sex and principal practice location.

The number of prior complaints was specified as a time-varying covariate. Age was also time-varying in the sense that we allowed doctors to move into higher age categories, commensurate with their age at the time of the complaint. We fit cluster-adjusted robust SEs to account for doctors who experienced repeated complaints over time.

Details of model selection and specification are described in the online supplementary appendix. All statistical analyses were conducted using Stata 12.1.

Risk predictions

To estimate doctors' risks of experiencing complaints over time, we plotted adjusted failure curves.[33 34] Details of the statistical techniques used to create these curves are provided in the online supplementary appendix. We also plotted failure curves showing the predicted risk of recurrent complaints for several individual doctors. Values for all failure curves were computed using coefficients from the main multivariable model, and hence, derived from the survivor function, $S(t)$.

Sensitivity analysis

We tested the robustness of estimates from the main multivariable analysis by rerunning the analysis on a subsample of complaints (n=10 010) with issue codes suggestive of relatively serious concerns (namely, poor clinical care, breach of conditions, rough or painful treatment and sexual contact or relationship).

RESULTS

Characteristics of complained-against doctors and complaints

The study sample consisted of 18 907 complaints against 11 148 doctors. Sixty-one percent of the complaints addressed clinical aspects of care, most commonly concerns with treatment (41%), diagnosis (16%) and medications (8%) (table 2). Nearly one quarter of complaints addressed communication issues, including concerns with the attitude or manner of doctors (15%), and the quality or amount of information provided (6%).

Seventy-nine percent of the doctors named in complaints were male, 47% were general practitioners and 14% were surgeons (table 3). Examples of several complaints are included in the online supplementary appendix.

Incidence and distribution of complaints

Doctors in the sample were complained against an average of 1.98 times (SD 2.31). The distribution was highly skewed, with a small subgroup of doctors accounting for a disproportionate share of complaints.

Figure 1 plots the cumulative distribution of complaints among doctors in six jurisdictions over a decade. (New South Wales data was not included in these plots because the complaints window there spanned only 5 years.) The curve on the left side of

Table 2 Issues in a national sample of 18 907 complaints filed by patients

	n	%*
Clinical care	11579	61
Treatment	7746	41
Diagnosis	3080	16
Medication	1572	8
Hygiene/infection control	190	1
Discharge/transfer	113	0.6
Other clinical care	127	0.7
Communication	4279	23
Attitude or manner	2823	15
Information	1132	6
Consent	582	3
Other communication	32	0.2
Costs or billing	1309	7
Medical records, certificates, or reports	1304	7
Access and timeliness	1257	7
Sexual contact or relationship	625	3
Rough or painful treatment	477	3
Confidentiality or information privacy	392	2
Breach of conditions	332	2
Grievance handling	213	1
Discrimination	103	0.5
Other	126	0.7

*Complaint issues sum to more than 100% because some complaints involved multiple issues.

Table 3 Characteristics of 11 148 doctors named in complaints

	n	%
Gender		
Male	8818	79
Female	2255	20
Missing	75	1
Speciality		
General practice	5289	47
Surgery	1540	14
Orthopaedic	432	4
General	398	4
Plastic	177	2
Other surgical	533	5
Internal medicine	1243	11
Obstetrics and gynaecology	541	5
Psychiatry	672	6
Anaesthesia	404	4
Ophthalmology	243	2
Dermatology	157	1
Radiology	200	2
Other	501	4
Missing	358	3
Age		
22–35 years	757	7
36–45 years	2624	24
46–55 years	3354	30
56–65 years	2184	20
66+ years	691	6
Missing	1583	14
Practice location		
Urban	8241	74
Rural	2775	25
Missing	132	1

the figure shows the distribution of complaints among doctors who experienced one or more complaints in the decade. Fifteen percent of doctors named in complaints accounted for 49% of all complaints, and 4% accounted for a quarter of all complaints. The curve on the right side of the figure shows the distribution of complaints across the full population of practicing doctors, not just those who experienced complaints. Three percent of all doctors accounted for 49% of all complaints, and 1% accounted for a quarter of all complaints.

Multivariable predictors of recurrent complaints

In multivariable analyses, the number of prior complaints doctors had experienced was a strong predictor of subsequent complaints, and a dose-response relationship was evident (table 4). Compared with doctors with one prior complaint, doctors with two complaints had nearly double the risk of recurrence (HR 1.93; 95% CI 1.79 to 2.09), and doctors with five prior complaints had six times the risk of recurrence (HR 6.16; 95% CI 5.09 to 7.46). Doctors with 10 or more prior complaints had 30 times the risk of recurrence (HR 29.56; 95% CI 19.24 to 45.41).

Risk of recurrence also varied significantly by specialty. Compared with general practitioners, plastic surgeons had twice the risk (HR 2.04; 95% CI 1.75 to 2.38), and risks were approximately 50% higher among dermatologists (HR 1.56; 95% CI 1.30 to 1.88) and obstetrician-gynecologists (HR 1.50; 95% CI 1.29 to 1.76). Anaesthetists had significantly lower risks of recurrence (HR 0.65; 95% CI 0.54 to 0.79).

Male doctors had a 40% higher risk of recurrence than their female colleagues (HR 1.36; 95% CI 1.23 to 1.50). Location of practice (urban vs rural) was not significantly associated with recurrence. Compared with doctors 35 years of age or younger, older doctors had 30–40% higher risks of recurrence; this level of heightened risk was similar through the middle-aged and older-aged groups.

Risks of recurrence over time

Doctors named in a third complaint had a 38% chance of being the subject of a further complaint within a year, and a 57% probability of being complained against again within 2 years (figure 2A). Doctors named in a fifth complaint had a 59% 1-year

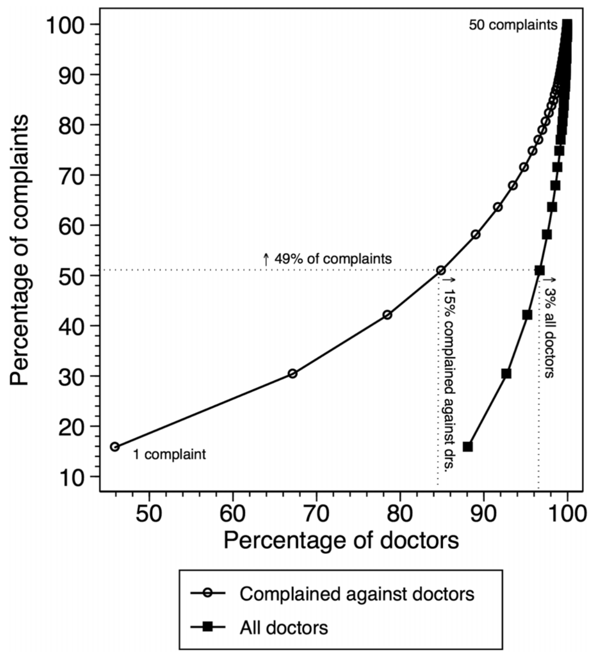

Figure 1 Cumulative distribution of complaints and doctors named in complaints.

complaint probability and a 79% 2-year complaint probability. Recurrence was virtually certain for doctors who had experienced 10 or more complaints, with 97% incurring another complaint within a year. Regardless of the number of previous complaints, doctors' risks of further complaints increased sharply in the first 6 months following a complaint, and then declined steadily thereafter. This is evident from the steep rise and then plateauing of the curves in figure 2A (these curves plot cumulative risks over time).

The curves shown in figure 2A depict average population-level risks for selected predictors, controlling for other covariates. However, our modelling approach is fundamentally designed to predict risk at the practitioner level. Figure 2B illustrates this; it shows wide variation in risk profiles among a selection of seven doctors in the sample. Doctor A, for instance, is a 62-year-old male general practitioner who accumulated 10 complaints over 9.2 years of observation. He had a 39% risk of recurrence after his fourth complaint, a 61% risk after his fifth complaint and a 94% risk after his sixth complaint.

Sensitivity analysis

Re-estimating the main multivariable model using a subset of 'severe' complaints produced very similar results to the main model. The online supplementary appendix shows the full set of results.

DISCUSSION

This study of patient complaints made to the chief health-quality regulators in Australia found that the complaints clustered heavily among a small group of doctors. Approximately 3% of practicing doctors accounted for half of all complaints. The number of prior complaints doctors had experienced was a particularly strong predictor of their short-term risk of further complaints. At the practitioner level, short-term risks of recurrence varied widely, from <10% risk among low-risk doctors to >80% risk among high-risk doctors. Overall, recurrent-event survival

Table 4 Multivariable regression analysis estimating risk of recurrent complaints*

	HR (95% CI)	p Value
Number of prior complaints		<0.001
1 (ref)	1.00	
2	1.93 (1.79 to 2.09)	
3	3.21 (2.87 to 3.59)	
4	4.54 (3.90 to 5.27)	
5	6.16 (5.09 to 7.46)	
6	8.83 (7.05 to 11.05)	
7	9.57 (7.40 to 12.37)	
8	9.49 (7.05 to 12.77)	
9	16.09 (11.72 to 22.10)	
10 or more	29.56 (19.24 to 45.41)	
States and territories		<0.001
1 (ref)	1.00	
2	2.23 (1.86 to 2.67)	
3	2.10 (1.75 to 2.53)	
4	1.91 (1.53 to 2.37)	
5	1.86 (1.52 to 2.29)	
6	1.73 (1.37 to 2.20)	
7	1.25 (1.02 to 1.53)	
Male doctor	1.36 (1.23 to 1.50)	<0.001
Urban practice location	0.98 (0.90 to 1.07)	0.65
Specialty of doctor		<0.001
Plastic surgery	2.04 (1.75 to 2.38)	
Dermatology	1.56 (1.30 to 1.88)	
Obstetrics and gynaecology	1.50 (1.29 to 1.76)	
General surgery	1.45 (1.17 to 1.80)	
Orthopaedic surgery	1.32 (1.20 to 1.44)	
Other surgery	1.30 (1.19 to 1.43)	
Ophthalmology	1.19 (1.02 to 1.40)	
Psychiatry	1.15 (1.02 to 1.29)	
General practice (ref)	1.00 (ref.)	
Internal medicine	0.93 (0.80 to 1.09)	
Radiology	0.89 (0.34 to 2.37)	
Anaesthesia	0.65 (0.54 to 0.79)	
Other	0.65 (0.51 to 0.82)	
Age of doctor		<0.001
<35 years	1.00 (ref.)	
36–45 years	1.31 (1.13 to 1.51)	
46–55 years	1.40 (1.22 to 1.62)	
56–65 years	1.43 (1.23 to 1.67)	
Gamma	−0.21 (−0.23 to −0.19)	

*Analysis based on 14 986 index complaints against 8749 doctors, and 6237 subsequent complaints.

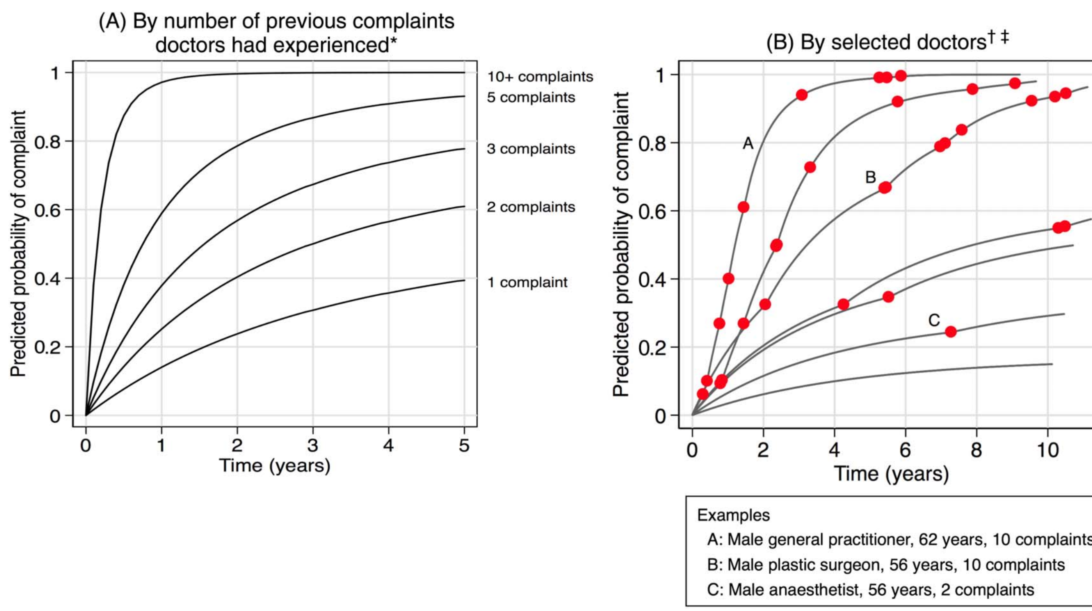

Figure 2 Probability of recurrent complaints over time.
*Curves adjusted for doctor age and sex, practice location, specialty, state and complaint year. †Dots on the curves indicate points in time when actual complaints occurred (ie, x-axis), but have no meaning in relation to predicted probability of complaints (ie, y-axis).
‡Ages reported refer to mid-points of the period over which the doctor was followed.

analysis showed considerable promise as a statistical approach for flagging complaint-prone doctors early in their complaints trajectory, using only a few simple descriptive characteristics.

Our study used a national sample to examine the distribution and predictors of medico-legal events. Patients treated in healthcare facilities throughout seven states and territories were eligible to file complaints with a Commission about the quality of the care they received. Previous studies of claims and complaints risk have tended to focus on pools of doctors covered by a single liability insurer or a few hospitals.

The extent to which complaints were concentrated in a small group of doctors was striking, consistent with other studies of complaints[7 19 22] and claims.[18] This highly skewed distribution of medico-legal events among doctors has several implications. The obvious one is that there is a pressing need for interventions that address the behaviour of doctors who are chronically complained or claimed against. Medical boards in Australia and elsewhere already address conduct, competence and health concerns with certain practitioners, but these efforts may fall short. Our study identifies a target population within which systematic deployment of interventions to improve performance[35 36] might be manageable: less than 500 doctors accounted for 25% of all complaints that named doctors in the decade under study. Immediate steps to improve, guide or constrain the care being provided by these 'high-risk' practitioners could be a very cost-effective way to advance quality and safety, and produce measurable benefits at the system level.

A more sobering implication of the clustering phenomenon is that remediation activities targeted at doctors who have attracted many complaints, while critical, come too late. Complaints are best understood as sentinel events, and complainants as representatives of much larger groups of harmed or dissatisfied patients.[37–39] By the time multiple complaints have accrued, substantial damage to quality of care is likely to have occurred already. The clustering of medico-legal events highlights the huge gains that would be put in reach by a capability to identify early doctors who are on course to incur multiple complaints.

Our approach is ripe for replication, not only by hospitals and regulators that hold complaints data, but within liability insurers with malpractice claims data, large hospital systems with risk management data, and medical boards and other professional bodies with data on disciplinary matters. Several distinctive aspects of our approach, descriptions of which follow, pave the way for better prediction of medico-legal risk in these settings than has been achieved to date.

Previous efforts to predict malpractice risk in liability insurance pools have included doctors with and without claims in their analyses.[11 14 15 17 19 21] This approach suits a core goal in many of these studies: to explore the feasibility of 'experience rating' doctors' liability insurance premiums.[24 40] By contrast, our study sought to predict risk for purposes of targeting quality-improvement interventions. In this context, it is appropriate to focus on doctors who have been the subject of at least one complaint because this is the group with whom regulators have a natural point of contact and opportunities to intervene. An ancillary benefit of this 'conditional' approach to modelling medico-legal risk is that it enhances the ability to identify strong predictors of recurrent risk.

A key technical challenge encountered in previous studies has been how to deal with the recurrent nature of medico-legal events. The approach used by Rolph[11 14 21] and others who have emulated his method,[15 17 24] 'fixes' the effect of prior events in a single variable at the doctor level. The 'weighted sum algorithm' behind the PARS risk score, developed by Hickson and colleagues, comes from analyses regressing a sample of 'risk management events' on information obtained from unsolicited patient complaints.[19 25] A limitation of both approaches is their static consideration of doctors' event histories. In its application, however, the PARS algorithm adopts dynamic features (doctors risk scores can be recalculated as new complaints appear over time).

An advantage of recurrent-event survival analysis is that it permits dynamic consideration of the effect of time-varying factors in the predictive model itself. In other words, it is not necessary to rely on a snapshot taken of a doctor's situation at a particular point in time: as risk profiles evolve—and the coefficients on the previous complaints variable in our study illustrate how dramatically this may occur—survival analysis incorporates these changes into the estimation of future risk. A related advantage of survival analysis is that it permits estimation of doctors' risk levels at different points in time—a year after an index event, 2 years later and so on. Our analysis showed that for some predictors, particularly the number of previous complaints, doctors' risks of additional complaints were non-linear: the risk tends to rise quickly over the several months after a complaint and then level off by the time the doctor reaches a year without further incidents. For clinical leaders, regulators and liability insurers trying to determine when in a doctor's trajectory of events to intervene to prevent recurrence, and how aggressively, this kind of temporal information may be very informative.

Our study has several limitations. First, the generalisability of our findings and method—to other types of medico-legal events, to other types of health practitioners, and outside Australia—is unknown, and should be tested. In other medico-legal settings, it may not be possible for practitioners to accrue the large numbers of events that some doctors in our sample did. Lower ceilings on the number of prior events may reduce the predictive value of this variable. Nonetheless, our analyses showed high risks of recurrence within 2 years (>60%) among doctors with as few as four complaints.

Second, the predictors we examined were doctor-focused. Other variables—including, patient characteristics,[41–44] case-type and outcomes,[39 45] doctors' ethnicity and country of training,[46 47] the practice setting, and aspects of the patient-doctor relationship[48]—may also predict complaint risk. However, because these variables are usually more difficult to measure at the population level, their suitability for large-scale predictive modelling is questionable. Moreover, given the high predictive values obtained with the simple doctor-level variables used in our analysis, the scope to boost predictive values with the addition of other variables is limited. Finally, we used head counts of practitioners, not more sophisticated measures of doctors' exposure to complaint risk, such as volume of patients treated or procedures conducted.

During the rise of the quality and safety movement over the last 15 years, medico-legal institutions have been largely on the sidelines. They remain essentially reactive enterprises, with workloads that focus on dealing with the fallout from care that has gone wrong. Patient safety experts regard the medico-legal system's fixation with posthoc assessments of individual behaviour, rather than prevention and systems, as anachronistic.[49] But as Rolph recognised 30 years ago,[11] methods for accurately and reliably forecasting the medico-legal risk of clinicians have transformative potential because they could focus and drive prevention. Identifying and intervening early with doctors at high risk of attracting recurrent medico-legal events has considerable potential to reduce adverse events and patient dissatisfaction system-wide; it may also help those doctors avoid the vicissitudes of medico-legal processes.

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Contributors MB, MS and DS developed the study idea, collected the data and conducted the analyses; MB and DS wrote the first draft of the manuscript; MW advised on design of the study, contributed expertise in interpretation and analysis of study data, and helped revise the draft manuscript; LG contributed to design and conduct of the statistical analysis and helped revise the draft manuscript; all authors reviewed and agreed on the submitted version of the manuscript. MB, MS and DS are guarantors for the study.

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SUPPLEMENTARY APPENDIX

MATCHING PROCESS

Doctors in Commissions' complaint databases were matched to doctors in the AMPCo Direct database in order to obtain a complete set of demographic variables—including including, age, sex, specialty and subspecialty, primary practice location—on all doctors in the study sample. The matching was probabilistic. It was done with FRIL linkage software (version 2.1.4, Emory University) and was based on doctor name, specialty, and practice postcode. The match rate across Commissions averaged 85% (range, 75% to 87%).

For doctors named in complaints who could not be matched to the AMPCo Direct list, we sought to retrieve any missing doctor-level information from publicly-accessible sources, including the national register of medical practitioners(1), newspaper obituaries and other media reports, and the newsletters of colleges, societies and other professional associations.

After both matching to the AMPCo Direct database and the manual addition of missing variables, 97% of doctors in the sample frame entered the study dataset.

DISTRIBUTIONAL/CLUSTERING ANALYSIS

Statistics on complaint clustering among doctors were calculated as follows:

(a) Number of complaints	**(b) Number of doctors with complaint count specified in column (a)**	**(c) % of all complained-against doctors with complaint count (strictly) exceeding that specified in column (a)**	**(d) % of all practicing doctors with complaint count specified in column (a)**	**(e) % of all complaints**
1 complaint	x	$(1 - (x / Q)) * 100$	$(1 - (x / R)) * 100$	$[1 - ((1 * x) / P)] * 100$
2 or more complaints	y	$(1 - (y / Q)) * 100$	$(1 - (y / R)) * 100$	$[1 - (((1*x) + (2 * y)) / P)] * 100$
n or more complaints	z	$(1 - (z / Q)) * 100$	$(1 - (z / R)) * 100$	$[1 - (((1*x) + (2 * y) + \ldots + (n * z)) / P)] * 100$

where P is the total complaint count, Q is the total number of complained-against doctors with and R is the total number of practicing doctors.

The statements in the manuscript reporting distribution of complaints among doctors were based on the doctor percentages calculated in column (c) and column (d), respectively, and the corresponding complaints percentages (i.e. same row) in column (e).

All values in the above table came directly from the analytic dataset, except the total number of practicing doctors (R). We obtained R from medical workforce data series[1] that is published annually by the Australian Institute of Health and Welfare, the official keeper of health statistics in Austalia.

Some additional information about the R value used is provided below:

- We elected to make R the total number of doctors in 2006, the mid-point of our study.

- To test how sensitive the distributional statistics were to the choice of the year 2006, we recalculated them using the R values from 2004 and 2008. Year-to-year variations in R had negligible effects on the distributional statistics. For example, on the basis of the 2006 R value, we report that around 1% of doctors accounted for 25% of all complaints.

The precise doctor percentages by year are: 1.0% (using R from 2004); 0.9% (using R from 2006); and 1.1% (using R from 2008). Similarly, we report that about 3% of doctors accounted for 49% of all complaints. The precise doctor percentages by year are: 3.6% (using R from 2004); 3.3% (using R from 2006); and 3.9% (using R from 2008). The increase in 2008 appears to be due to a minor change in the way that the Australian Institute of Health and Welfare tallied doctors, rather than a consequence of a substantial year-to-year change in the total number of doctors.

- To create the appropriate R value for purposes of our study, several adjustments had to be made to the raw doctor totals by state and territory reported in the AIHW labour force report. Specifically:

    - We subtracted the total number of doctors in South Australia; this was the state that did not participate in the study.

    - We subtracted the total number of doctors in New South Wales because complaints from this state were not used in the distributional statistics. The "exposure period" on which the distributional statistics are based is 10 years and, as we explain in the manuscript: *"Data from New South Wales was not included in these plots because the complaints window there spanned only five years."*

    - Although Commissioners' have regulatory authority over both private and public health services in their jurisdictions, there were challenges in some jurisdictions in capturing complaints arising from the public hospital setting. In four of the six jurisdictions whose data was used for the distributional statistics, Commissioners have a practice of opening public hospital complaint files in the name of the hospital, not individual clinicians. This inhibited our ability to identify complaints against doctors in these jurisdictions when they arose in the public hospital setting. The other two jurisdictions routinely open complaint files in the name of any clinician complaint against, regardless of where the care is rendered.

      We accounted for this variation in "exposure" to complaints in constructing R. For the four states in which our complaints data did not include public hospital complaints, the states' contribution to R was based on a count of doctors who were employed (at least some of the time) in private practice (this included all General Practitioners). Doctors in full-time public practice were excluded. For the two states in which our complaints data included public hospital complaints, we used counts of all doctors.

- Finally, we note that our method of calculating R by summing doctor totals in each state and territory may have resulted in a slight over-count, because some doctors practice in multiple jurisdictions. In the absence of a national registration scheme (which did not commence in Australia until July 2010), we were unable to quantify the extent of this over count. Its effect would be to render our estimates of complaint clustering among doctors a lower bound on the true extent of clustering.

Multivariable Analysis

Choice of statistical model

For our main analysis, we used a model that had a common baseline hazard and defined time as time since entry into the study (from the date of a doctor's first complaint). This model is generally referred to as the Anderson-Gill (AG) model.(2) In addition to assuming a common baseline hazard, this model treats all failures (initial and subsequent) as exchangeable and independent, conditional on the covariates. The general form of the hazard function for the AG model is

$$h_j(t|x_j) = h_0(t)exp(x_j\beta)$$

where $h_0(t)$ is the baseline hazard and $x_j\beta = \beta_1 x_1 + \beta_2 x_2 + \dots \beta_n x_n$ estimates how the hazard changes as a function of specified covariates.

One criticism of the AG model is that its assumption about a common baseline hazard may not be appropriate in all situations. An alternative approach would be to use a model that allowed the baseline hazard to vary with the occurrence of successive "events". (In our analysis, "events" refer to the number of complaints a doctor experienced.) This type of model is commonly referred to as a Prentice, Williams and Peterson counting process model(3) (PWP-CP); it is a conditional model in the sense that the subject can only be at risk of the *k*th event if the *k* – 1 event has occurred.(4) The hazard function for this model is

$$h_{jk}(t|x_{jk}) = h_{0k}(t)exp(x_{jk}\beta), \quad k = 1, 2, \dots$$

where $h_{0k}(t)$ is the stratum-specific baseline hazard.

An important disadvantage of the PWP-CP model in the context of our study is that it precludes direct estimation of hazard ratios showing the effect of number-of-previous-complaints. This is problematic because we hypothesized that this previous complaints variable would be a key predictor of doctors' risk of subsequent complaints, and therefore sought to quantify the magnitude of its effect. Nonetheless, in sensitivity analyses described below, we fit a PWP-CP model to our data and compare estimates from it to the AG model used in the main analysis. (This particular sensitivity analysis is not reported in the manuscript due to space constraints and its technical nature for a general medical audience).

Estimation method

AG models can be estimated with Cox regression or with fully parametric models. We used a fully parametric approach for two main reasons: (1) it allows estimation of the shape of the baseline hazard; and (2) it gives smooth estimates of the baseline hazard and survivor functions. Neither of these is possible with Cox models.

Distribution of time

Estimates from parametric models can be sensitive to choices made about the type of distribution imposed in time in the model. The standard options are the Gompertz distribution and the Weibull distribution. When the distribution of time is assumed to follow a Gompertz distribution, the hazard function for the AG model is

$$h_j(t|x_j) = exp(\gamma t)exp(x_j\beta)$$

where $exp(\gamma t)$ is the baseline hazard function and γ is an ancillary parameter estimated from the data. When the distribution of time is assumed to follow the Weibull distribution, the hazard function for the AG model is

$$h(t|x_j) = pt^{p-1}exp(x_j\beta)$$

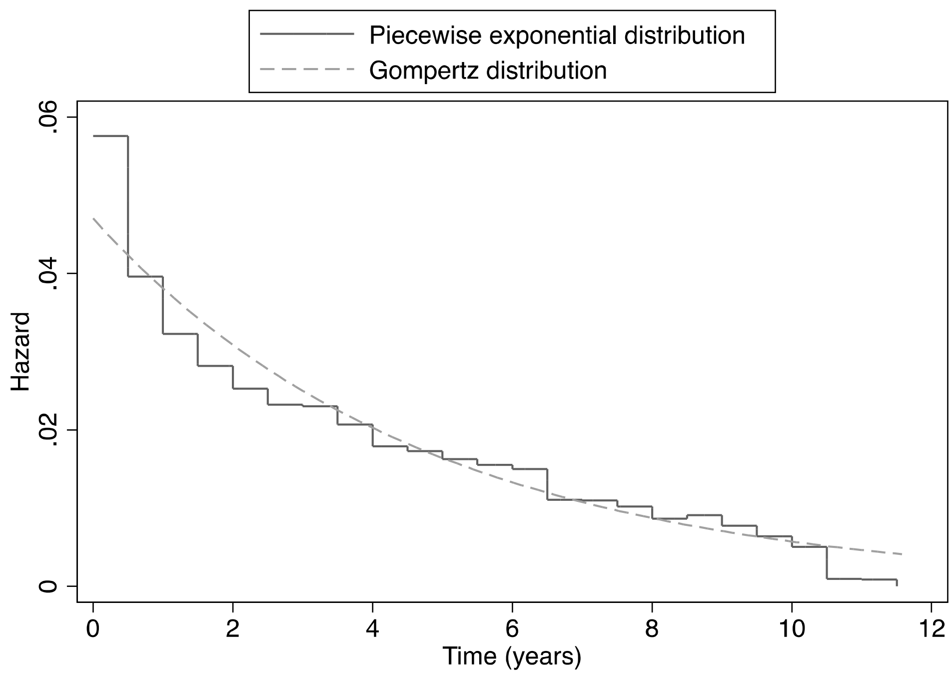
where pt^{p-1} is the baseline hazard function and p is the shape parameter, which is also estimated from the data.

To determine the most appropriate distribution for the baseline hazard, we fit two AG models to the data; one model used a Gompertz distribution, the other used a Weibull distribution. All covariates reported in Table 3 of the manuscript were included in these models. We compared the fit of these two models using AIC statistics (AIC Gompertz = 24957.55 vs AIC Weibull = 24976.17) and this comparison favored a Gompertz distribution.

We then subjected the Gompertz distribution to a second evaluation. We fit a piecewise exponential model(5) to the data; this type of model splits time into half-year intervals and estimates the hazard within each interval. The baseline hazard estimated from this model was plotted against the baseline hazard estimated from the Gompertz AG model.

Figure A1 compares the Gompertz baseline hazard and the baseline hazard estimated from the piecewise exponential model. The comparison showed close concordance between the two hazards and confirmed our choice of the Gompertz distribution, which was then used in all subsequent multivariable analyses.

Figure A1: Comparison of baseline hazard function for a piecewise exponential distribution and a Gompertz distribution



Sensitivity Analyses

We conducted two sensitivity analyses: re-runs of the main multivariable model (1) using only “serious” complaints; and (2) fitting a PWP-CP model instead the AG model. **Table A2** shows coefficients and cluster-adjusted standard errors from these two re-runs, alongside those from the main multivariable model.

Table A1: Multivariate survival analysis estimating risk of recurrent complaints – main model and two sensitivity analyses

	(A) Main model: AG		(B) Sensitivity analysis: PWP-CP		(C) Sensitivity analysis: Serious complaints only	
	Coef.	Robust SE	Coef.	Robust SE	Coef.	Robust SE
Number of prior complaints						
1 (ref)	--	--	--	--	--	--
2	0.66	0.04	--	--	0.68	0.05
3	1.17	0.06	--	--	1.27	0.08
4	1.51	0.08	--	--	1.69	0.10
5	1.82	0.10	--	--	1.93	0.14
6	2.18	0.11	--	--	2.35	0.18
7	2.26	0.13	--	--	2.42	0.17
8	2.25	0.15	--	--	2.33	0.21
9	2.78	0.16	--	--	2.72	0.25
10 or more	3.39	0.22	--	--	3.70	0.30
States and Territories						
1 (ref)	--	--			--	--
2	0.80	0.09	0.91	0.10	0.81	0.12
3	0.74	0.09	0.81	0.11	0.84	0.13
4	0.64	0.11	0.71	0.12	0.62	0.15
5	0.62	0.10	0.70	0.11	0.58	0.14
6	0.55	0.12	0.64	0.14	0.60	0.17
7	0.22	0.10	0.24	0.12	0.14	0.14
Male doctor	0.31	0.05	0.36	0.06	0.33	0.08
Urban practice location	-0.02	0.04	0.001	0.05	0.01	0.06
Specialty of doctor						
Plastic surgery	0.71	0.08	0.86	0.08	0.92	0.09
Dermatology	0.45	0.09	0.60	0.13	0.59	0.13
Obstetrics and gynaecology	0.41	0.08	0.47	0.12	0.54	0.09
Orthopaedic surgery	0.27	0.05	0.29	0.06	0.33	0.07
Other surgery	0.26	0.05	0.31	0.06	0.36	0.07
General surgery	0.37	0.11	0.39	0.12	0.59	0.13
Ophthalmology	0.18	0.08	0.13	0.09	0.26	0.10
Psychiatry	0.14	0.06	0.18	0.08	0.15	0.08
General practice (ref)	--	--	--	--	--	--
Internal medicine	-0.07	0.08	-0.09	0.10	-0.06	0.11
Radiology	-0.11	0.50	-0.13	0.58	-0.21	0.49
Anaesthesia	-0.43	0.10	-0.48	0.11	-0.57	0.15
Other	-0.44	0.12	-0.49	0.14	-0.39	0.16
Age of doctor						
<35 years	--	--			--	--
36 to 45 years	0.27	0.07	0.32	0.09	0.18	0.10
46 to 55 years	0.34	0.07	0.39	0.08	0.31	0.10
56 to 65 years	0.36	0.08	0.44	0.09	0.31	0.10
Constant	-3.04	0.12	-2.90	0.14	-3.39	0.16

Table A1, continued.

	(A) Main model: AG		(B) Sensitivity analysis: PWP-CP		(C) Sensitivity analysis: Serious complaints only	
	Coef.	Robust SE	Coef.	Robust SE	Coef.	Robust SE
Gamma	-0.21	0.01	--	--	0.20	0.01
$k = 2$	--	--	0.18	0.01	--	--
$k = 3$	--	--	0.25	0.01	--	--
$k = 4$	--	--	0.27	0.02	--	--
$k = 5$	--	--	0.31	0.02	--	--
$k = 6$	--	--	0.35	0.02	--	--
$k = 7$	--	--	0.35	0.02	--	--
$k = 8$	--	--	0.34	0.03	--	--
$k = 9$	--	--	0.39	0.03	--	--
$k = 10$	--	--	0.45	0.03	--	--
Constant	--	--	-0.30	0.02	--	--

The first sensitivity analysis is described in the manuscript. A full set of results from it are shown in column C of Table A1 (above).

The second sensitivity analysis used the PWP-CP model, which involves relaxation of the common baseline hazard assumption in the AG model. This model is described in the "Choice of statistical model" subsection above. Comparisons of the estimates from the PWP-CP model (column B in Table A1) and main model (column A) suggest that the shape of the baseline hazard differs across the strata (that is, the number of previous complaints). However, this difference appears to have negligible effects on the values of the coefficients and standard errors for the other variables in the model, which are very similar. In sum, the comparison supports the view that our results on predictors such as specialty, doctor sex, doctor age etc. are not sensitive to choice of the AG model over the PWP-CP model.

Model diagnostics

We conducted several tests to evaluate the specification and fit of main multivariable model.

To assess model goodness of fit, we plotted partial Cox-Snell residuals from the main model against the empirical cumulative hazard function (derived from Kaplan-Meier values). The results are shown in **Figure A2**. The residuals follow the straight line closely between values of 0 and 4, but deviate from the line thereafter. The deviant values represent only a small fraction of the data (n = 18 complaints out of thousands); the dotted box in the figure shows where 99.9% of the data lies. Thus, the plot suggests that the model provides a reasonable fit for virtually all of the data.

Figure A3 shows the cumulative Cox-Snell residuals plotted against time, a plot that is useful in detecting influential observations. A total of 26 doctors have influence values greater than 10. Re-estimation of the main model without these observations did not alter the parameter estimates, which suggests minimal influence of "outlier" observations on our results.

Figure A2: Cox-Snell residuals to evaluate model fit.

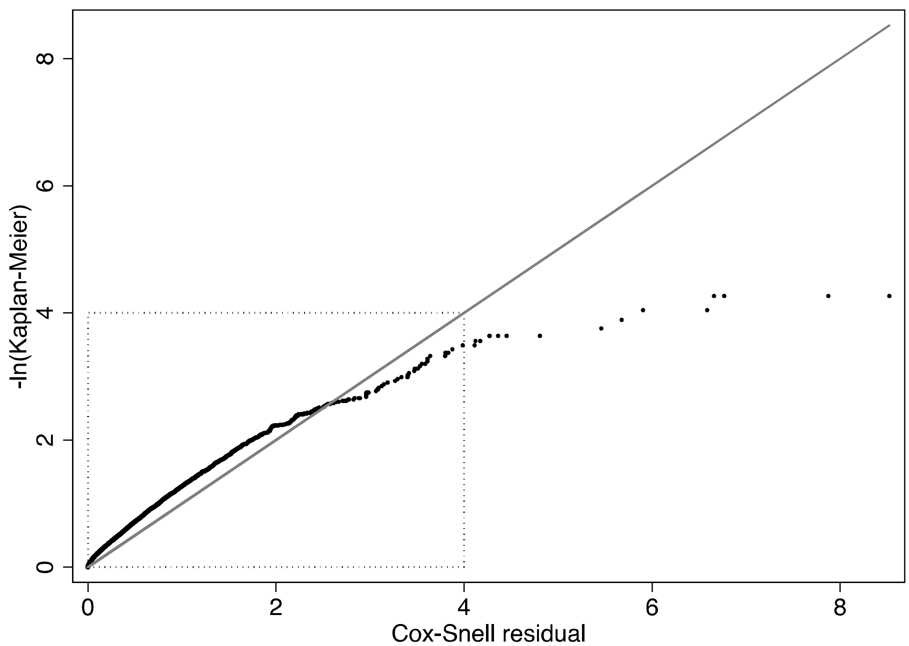
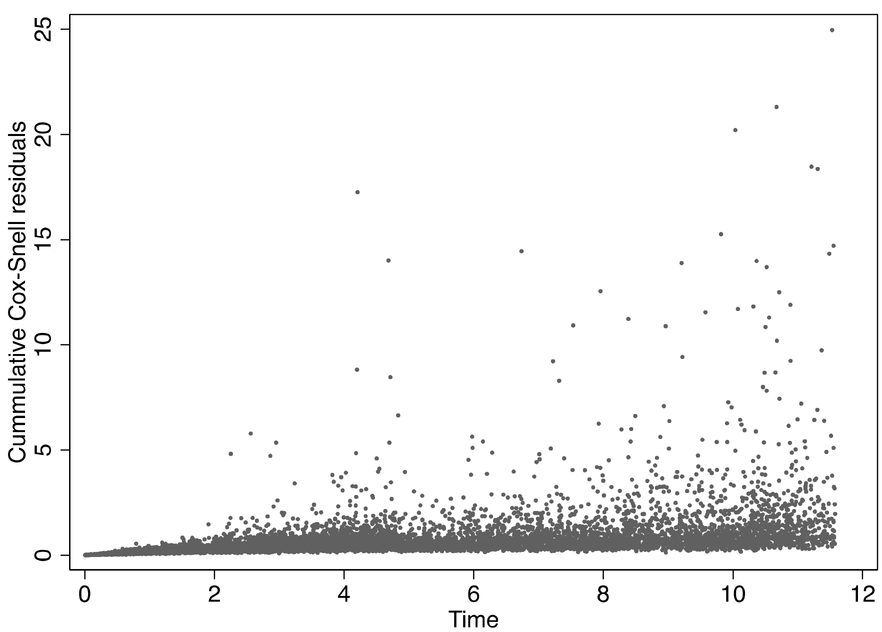


Figure A3: Cumulative Cox-Snell residuals to identify influential observations



POPULATION-LEVEL RISK PREDICTIONS

Typically, Kaplan-Meier curves are plotted to show differences in survival (or failure) between two or more groups. This approach is also useful in observational studies, such as ours, but it needs to be modified to reflect adjustments made during modeling to accommodate the influence of measured risk factors that potentially confound the association between the exposure and the outcome.

One method of adjustment involves comparing survival between "constructed" subjects with collections of fixed characteristics (e.g. male middle-aged GPs practicing in urban settings vs female middle-aged GPs practicing in urban settings, etc). A second method of adjustment involves examining the effect of a selected variable while setting the values of all other covariates to their mean values. Neither of these approaches is particularly attractive. The fixed construct method complicates presentation of findings and becomes difficult with more than a couple of variables of interest. The averaging method is suspect for certain fixed categorical covariates, such as sex, because mean values for these variables are intrinsically artificial.

A third method of adjustment, sometimes referred to as adjusted survival curves, (6,7) is more attractive and well-suited to our study. In this method, survival curves are estimated for each individual using results from a multivariable analysis, and then averaged at each of a series of closely-spaced time points to plot fitted curves. The averaging assumes everyone takes the same stated level of the variable of interest, but that otherwise their covariate pattern is unchanged. The process is a specific example of Robins' G-computation(8), an approach for estimating the causal effect of an exposure, which Snowden et al(9) have shown is equivalent to a form of model-based standardization where the reference group is the observed study population. The method is flexible and able to handle multiple fixed and time-dependent covariates, and an unbalanced distribution of covariates.(6)

In applying this method to our analysis, we began calculating the adjusted survival curves by computing a failure function for each individual in the study

$$F(t) = 1 - \exp\{-\lambda\gamma^{-1}(e^{\gamma t} - 1)\}$$

where $\lambda_j = \exp(x_j\beta)$ and γ is the ancillary parameter estimated from the data (based on the Gompertz distribution). Using the coefficients from the main model, we calculated $F(t)$ over a grid of values for *t*, ranging from *t* = 0 to *t* = 5 years in 1 month increments.

For example, to isolate the effect of a sex, we calculated survivor functions for all doctors by forcing this variable to have a value of “male”, while leaving all other covariates at their observed values. The calculations were done over the grid of time values, and then averaged at each time value. The procedure was then repeated after forcing the variable to have a value “female”.

Adjusted failure curves for the “number of previous complaints” variable are reported in the main paper. To calculate these estimates, we recoded all observations so that each individual had experienced only 1 complaint, but all other variables remained at their observed values. We calculated $F(t)$ for each individual and then averaged these values for each value of *t*. This process was repeated, setting number of prior complaints to 2 complaints, 3 complaints, 5 complaints and 10+ complaints to produce the plots shown in Figure 2 (Panel A) of the manuscript.

We calculated analogous estimates for other significant covariates, but have elected not to show them due to limitations of space. However, adjusted survival curves for doctor specialty and doctor sex are shown below.

Figure A4: Specialty of doctor

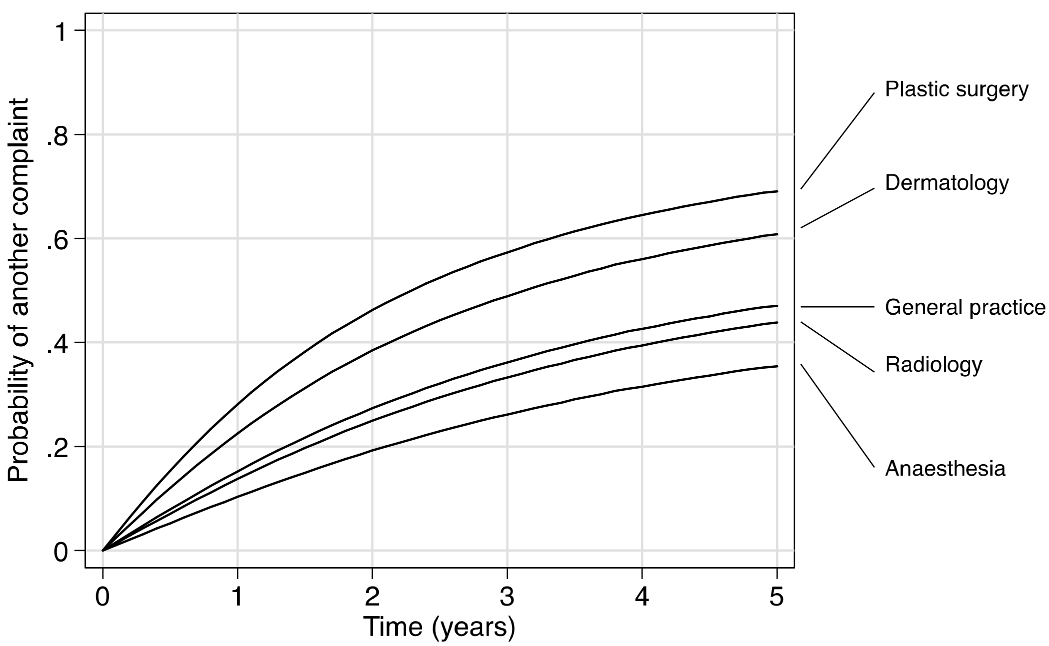
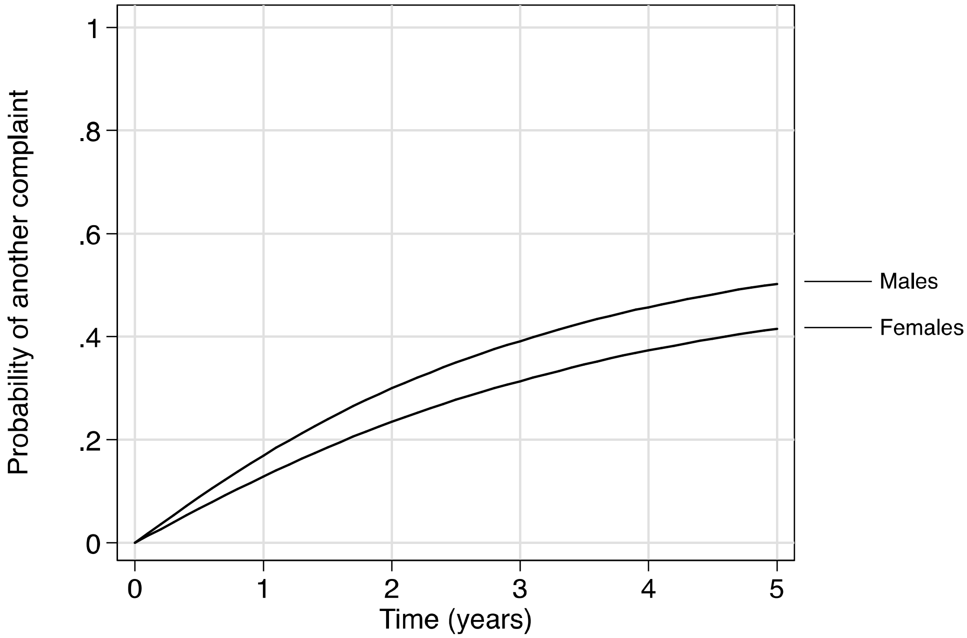


Figure A5: Sex of doctor



EXAMPLES OF COMPLAINTS

Example 1:
A male patient complained that there had been a 12 month delay in diagnosis of his non Hodgkin's Lymphoma. He had attended a general practitioner's clinic 4 times and described consistent symptoms. The GP eventually referred him for an x-ray. The man was told the x-ray was reported as 'normal'. It was only after he was referred for an emergency CT scan that the x-ray was reviewed. He received a financial settlement.

Coding: Clinical care - diagnosis

Example 2:
To treat endometriosis, a female patient had undergone a surgical procedure to divide the ligaments around her uterus. She experienced chronic pain following the procedure, something she claimed the obstetrician-gynaecologist who did the procedure had not discussed with her. The obstetrician-gynaecologist did not deny this. His response letter stated: "I did not really discuss the risks of the procedure. The husband was sick of having a wife who was always in pain, so really there was no choice."

Coding: Communication - consent

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BMJ QUALITY & SAFETY

Half of all patient complaints in Australia are about 3% of doctors

“Frequent fliers” concern for health services everywhere, but issue still veiled in secrecy

[Identification of doctors at risk of recurrent complaints: a national study of healthcare complaints in Australia Online First doi 10.1136/bmjqs-2012-001691]: research
[Not so random: patient complaints and ‘frequent flier doctors Online First doi 10.1136/bmjqs-2013-001902]: editorial
[Physicians with multiple patient complaints: ending our silence Online First doi 10.1136/bmjqs-2013-001880]: editorial

Half of all formal patient complaints made in Australia to health ombudsmen concern just 3% of the country’s doctors, with 1% accounting for a quarter of all complaints, finds research published online in ***BMJ Quality & Safety***.

Doctors complained about more than three times are highly likely to be the subject of a further complaint - and often within a couple of years - the findings show.

The problem is unlikely to be confined to Australia, warn commentators, who point out that while regulators often know about these problem doctors, patients usually don’t.

The researchers base their findings on a national sample of almost 19,000 formal patient complaints filed against 11,148 doctors with health service ombudsmen (commissions) across Australia between 2000 and 2011.

Over 60% (61%) of the complaints concerned clinical aspects of care, while almost one in four (23%) concerned communication issues, including the doctor’s attitude and the quality or quantity of information provided.

Most (79%) of the doctors involved in complaints were men, and over half of all those complained about (54%) were aged between 36 and 55.

When the distribution of complaints was analysed across all doctors in practice, this showed that 3% of practitioners accounted for 49% of all complaints made; and 1% accounted for a quarter.

The researchers looked at factors that might help to flag up those doctors at high risk of attracting further complaints.

Male gender, older age, and working in surgical specialties were all associated with a higher risk of repeat complaints. But the number of previous complaints was the strongest predictor.

Doctors named in a third complaint had a 38% chance of being named in another one within one year, while those with 10 complaints against them were virtually certain to add another to their total within 12 months.

The authors argue that the approach they used to predict complaint risk could be used to spot problem doctors earlier, so improving the quality and safety of patient care.

In an accompanying editorial, Professor Ron Paterson, of the Faculty of Law at the University of Auckland in New Zealand, comments that few people will be surprised that a group of “frequent flier” doctors attract a disproportionate share of complaints.

“What is surprising is the extent of the problem,” he writes, describing it as “an albatross around the neck of the Australian medico-legal system - and a problem likely to be replicated in other countries, even though the regulatory actors may differ.”

He advocates that three or more complaints about a doctor should become a matter of public record. "The current veil of secrecy over most complaints (which avoid publicity by never reaching the stage of disciplinary proceedings) allows repeat offenders to continue unheeded," he suggests.

Countries should follow the example of the UK doctors' regulator, the General Medical Council, and introduce formal appraisal of a doctor's practice as part of revalidation, he argues.

In another editorial, Drs Thomas Gallagher and Wendy Levinson of the Universities of Washington and Toronto, respectively, reiterate that the findings are unlikely to be unique to Australia, and warn that the true extent of the issue is likely to be much greater than formal complaints would suggest.

They caution against dismissing communication problems as irrelevant: doctors who find it difficult to talk to patients often find it hard to communicate with colleagues, they say, while the evidence suggests that poor communication has an impact on safe and high quality care, they add.

"The critical first step is for all of us to begin speaking up when we know that a colleague is struggling in their interactions with patients and with peers," they write.