Title: Patterns and trends among physicians in training named in civil legal cases

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Funding statement: This study was internally funded by the Canadian Medical Protective Association.

Word count (max 2500 words): 2,936

Detailed Keywords (freeform; max 6): Malpractice, postgraduate medical education, patient safety

Keywords (specified from drop-down list; required 1; max 6): Medicine and the Law

ABSTRACT

Background: Studying medico-legal data provides opportunities for making medical care safer for patients. Little has been published on the medical malpractice experience of physicians-in-training.

Methods: We conducted a retrospective descriptive study of data from closed civil legal cases assisted by the Canadian Medical Protective Association (CMPA), a mutual medico-legal defense organization for over 100,000 physicians, representing an estimated 95% of Canadian physicians. Eligible cases involved ≥1 physician-in-training (residents or fellows) and were closed between 1993-2017 (for time trends) or 2008-2017 (descriptive analyses). We analyzed case duration, medico-legal outcome, and patient harm for cases concluded between 2008-2017. We also examined physician specialties and practice characteristics in these cases.

Results: Over a 25-year period, 2951 cases included a total of 4921 physicians-in-training. The rate of civil legal cases involving physicians-in-training decreased significantly, from 31 per 1,000 CMPA members in 1993 to 23 per 1,000 in 2017 (average annualized decrease = -2.7%, P<0.0001). Between 2008-2017, 1,901 physicians-in-training were named in 1,107 civil legal cases, compared to 24,012 physicians named in 12,622 cases with no physicians-in-training. Cases involving physicians-in-training were associated with more severe patient harm than cases without a physician-in-training. Physicians-in-training from surgical specialties were named most often (531/951; 55.8%).

Interpretation: The risk for physicians-in-training being named in civil legal cases has diminished in the last decade, but cases with trainees featured more severe patient harm than cases without. Efforts to promote patient safety may enhance the safety of care and reduce the frequency and severity of medical malpractice issues for physician-in-training.

BACKGROUND

In the context of postgraduate medical education, US studies have shown that up to 30% of civil legal cases involve at least 1 physician-in-training.[1,2] Physicians-in-training have expressed concern regarding their medico-legal liability,[3-5] and educators have called for better educational offerings to prepare this group for medico-legal liability in their practice.[6-8] A recent analysis showed an overall significant positive association, over 10 years, between the volume of patient safety events and civil legal cases in Canadian hospitals, suggesting that improvements in patient safety could be associated with decreased medico-legal risk.[9]

There has been very little research to date describing both the frequency and severity of medico-legal cases involving physicians-in-training, or the practice characteristics specific to this group as individual healthcare professionals named in civil legal cases.[10-12] Medical educators and physicians-in-training need access to data that informs and prepares them to mitigate risks they will face in practice, both from a patient safety and medico-legal perspective.

In this study, we analyzed data from a national medico-legal repository with an aim to describe and characterize civil legal cases involving physicians-in-training in Canada. Our first objective was to examine how the rates of closed civil legal cases involving physicians-in-training have changed over 25 years relative to non-trainee physician members of the CMPA. Our second objective was to characterize the severity and timing of civil legal cases (closed between 2008-2017) involving physicians-in-training, including the severity of patient harm, case

duration, and medico-legal outcomes, and compare them to cases involving non-trainee physicians. Our third objective was to compare practice characteristics for the physicians-in-training involved in a civil legal case (closed between 2008-2017) to those of non-trainee members of the CMPA and physicians-in-training overall in Canada.

METHODS

Study design

We conducted retrospective analyses of closed civil legal actions and threats of a civil legal action naming at least 1 physician-in-training. The ethics review panel of the Advarra (formerly Chesapeake) Institutional Review Board, based in Aurora, Ontario, and comprising Canadian members, reviewed and approved the study in compliance with Canada's Tri-Council Policy Statement on the Ethical Conduct for Research Involving Humans (TCPS 2). Funding and support for this research was provided by the Canadian Medical Protective Association (CMPA).

Data sources

The CMPA is a national medico-legal mutual defense organization for physicians with over 100,000 members, of whom 12% are physicians-in-training. Approximately 95% of Canadian physicians are CMPA members, who are able to obtain medico-legal assistance from the CMPA on a discretionary basis. The CMPA maintains a national repository of medico-legal information on the files in which it assists members from across the country. During the study timeframe, most physicians-in-training in Canada were members of the CMPA, (with the

exception of most of physicians-in-training practicing in the province of Québec). Eligible CMPA data were organized by case. Each case represents an instance during which a physician or multiple physicians contacted the CMPA after being named in a civil legal action, or threat of a civil legal action, involving patient care. To capture and characterize key details about civil legal cases, medical analysts, who are experienced registered nurses and CMPA employees, reviewed *closed cases* and coded specific clinical details using the Canadian enhancement to the International Statistical Classification of Diseases and Related Health Problems, 10th revision[13] and the Canadian Classification of Health Interventions.[14] They also coded the level of patient harm using an in-house classification system based on the American Society for Healthcare Risk Management's "Healthcare Associated Preventable Harm Classification". [15]To reduce misclassification, analysts conducted quality assurance reviews of coding on a weekly basis.

To describe practice characteristics of physicians-in-training, we examined publicly available, national data from the Canadian Post-M.D. Education Registry (CAPER), [16] a branch of the Associated Federation of Canadian Medical Schools responsible for collecting and reporting data from all of the 17 Canadian residency programs. We selected the use of CAPER data because, as Canada's main source of routinely collected, administrative data on residency programs, it provides some physician-level variables that are comparable with those presented in the current analysis.

Case selection

Throughout the manuscript, we refer to civil legal actions and threats of a legal action against physicians collectively as civil legal cases. This is a study of *closed cases*, meaning cases with a final medico-legal outcome determined by the court or a mutual agreement between parties, or cases not pursued by the plaintiff (see **eTable 1** for glossary of terms). All of our analyses focused on civil legal cases where at least 1 physician-in-training—including clinical fellows—was named.[17] Each case may have involved more than one physician. We included only cases where physicians-in-training were CMPA members and who required assistance from the CMPA at the time they provided clinical care. To avoid duplicates in frequency counting, we excluded class action lawsuits from our analysis.

For our trend analysis, we included civil legal cases involving physicians-in-training that closed over a 25-year period between January 1, 1993 and December 31, 2017. To explore more current cases in depth, we conducted a descriptive analysis on cases with a date of occurrence (of the index patient encounter) between January 1, 2008 and December 31, 2017 (**Figure 1**).

While the CMPA repository included a physician's status as a physician-in-training, specific information on specialty and year of training were not routinely collected. Although we intended to analyze every physician-in-training, we subsequently decided specialty and postgraduate training year (PGY) were both necessary to provide findings on training context. We therefore elected to exclude cases if a physician-in-training's specialty or PGY was unavailable. Additionally we excluded cases where the physician-in-training was practicing

independently during the index occurrence, called “moonlighting” in some regions.[18] We also excluded a small number of cases where a physician-in-training was named due to mistaken identity. For consistency, accuracy, and to confirm eligibility, all of these cases were reviewed first by the lead author (AM) and a second time by either a CMPA research nurse or trained research assistant.

Variables

To characterize the severity of civil legal cases, we extracted the level of patient harm according to a 5-point scale represented as: 1-no harm or asymptomatic, 2-mild, 3-moderate, 4-severe, 5-death (defined in **eTable 2**). We considered patient harm as an outcome that negatively affects a patient's health and/or quality of life.[19] We also extracted the number of physicians named per case, medico-legal outcomes for physicians (e.g., settlement), and case duration. To understand the length of time physicians-in-training were involved in civil legal cases, we also calculated case duration in months by subtracting a case’s start date from its end date. Specifically, the case start date was the day on which the physician member first contacted the CMPA about the case, either by telephone or by letter, and the case end date was the day on which the CMPA received an official closing letter from legal counsel. Furthermore for each case, we extracted the month and year for the date of the patient physician encounter.

To describe practice characteristics, we extracted the physician’s geographic region, specialty, and PGY for physicians-in-training. CMPA data infrastructure required us to group cases according to the CMPA’s fee-based geographic

regions: Québec, Ontario, Western Canada (Alberta and British Columbia), and the rest of Canada (Saskatchewan, Manitoba, Atlantic Canada and the Territories).

We also extracted data on whether the physician-in-training reported being *on call* and whether they reported being *on service* at the time of the index occurrence. Due to the relatively small size of many specialty programs, we report only the cases grouped by specialty when more than 10 physicians-in-training from that specialty were named. We amalgamated case specialty groups with fewer than 10 physicians-in-training under the categories “other non-surgical specialties” and “other surgical specialties”.

Data analysis

In order to describe how litigation rates have changed over time, we conducted a 25-year trend analysis of cases closed from 1993-2017, comparing cases with at least 1 physician(s)-in-training to cases without a physician-in-training. To allow comparison, we stratified CMPA member physicians into three practice groups: physicians-in-training, family physicians in practice, and physicians from other specialties. We calculated each group’s relative medical malpractice litigation rates per 1,000 physician members per year. We fitted a trend line for each physician group and calculated the annualized growth rate based on the fitted trend. We then compared the annualized growth rates between the three physician groups using an ANOVA (analysis of variance) Type III sum of squares test. Statistical tests were two-tailed and we considered P values < 0.05 to be statistically significant.

We used frequencies and proportions (for categorical variables) and medians and ranges (for continuous variables) to characterize the severity and timing of cases and to describe practice characteristics for cases closed between 2008-2017 that involved at least one physician-in-training. We compared the level of patient harm and the number of physicians per case to cases involving non-trainee CMPA members. Similarly, we compared practice characteristics to those of non-trainee CMPA members, and physicians-in-training overall in Canada (from CAPER data[16]). All study findings were discussed during regular meetings of the co-author team to discuss and address potential sources of bias. We completed all statistical analyses using SAS 9.4©.

RESULTS

Trend analysis

The 25-year trend analysis identified 36,535 eligible cases representing 70,412 physicians named in a medico-legal case closed between 1993-2017 (**Figure 2**). Over the 25-year study period, the litigation rate per 1,000 physicians decreased significantly (all $P < 0.0001$) for all three practice groups. The number of physicians-in-training named in medico-legal cases decreased at an average rate of 2.7% per year, compared to 1.9% per year for family physicians, and 1.8% per year for other specialties. Physicians-in-training per 1,000 physician members named in medico-legal cases decreased from 31 in 1993 to 23 in 2017. Physicians-in-training had a similar litigation rate as family physicians, while CMPA members in surgical and other specialties had a significantly higher litigation rate ($P < 0.0001$) across the 25 years examined.

Case severity and timing

Between 2008 and 2017, there were 121,902 non-trainee CMPA members and 45,967 physicians-in-training CMPA members. The CMPA closed 13,729 cases during this 10-year period. A total of 1,901 physicians-in-training were named in 1,107 civil legal cases meeting our eligibility criteria. Across the 1,107 cases, 673 (60.8%) involved patients who had experienced healthcare-associated harm. In those 673 cases, 306 (45.6%) patients experienced little to mild harm; while the remaining 367 patients (54.5%) experienced severe harm or died. In contrast, among 6,535 civil legal cases involving healthcare-associated harm that did not involve ≥ 1 physician-in-training, 2,266 cases (34.7%) involved severe patient harm or death (**Table 1**).

The median number of physicians named in a case was 3 (range, 1-30) for 1,107 cases involving physicians-in-training (including at least one trainee and non-trainee physicians). In contrast, there was a median of 1 physician per case (range, 1-37) for 12,622 cases not involving physicians-in-training. Of the eligible cases, 92.8% (1,027/1,107) involved at least one additional physician, and 34.7% (384/1,107) involved more than one physician-in-training.

A civil legal case may commence many months after the case's index patient encounter. The median time interval between a case's index patient encounter and the commencement of a civil legal case was 26 months (range, 0-314 months). From there, cases often took years to resolve (**Figure 3**). Many physicians-in-training (869/1,107, 78.5%) were found not to be a primary player in the litigation and were eventually released from the civil legal action after a median of 39 months (range, 0-235) months. A smaller number of cases

progressed to reach a settlement (97/1,107, 8.8%) or to trial (9/1,107, 0.8%). However, the median duration for these cases was longer, at 47 months (range, 8-196 months) for a settlement and 75 months (range, 51-155 months) for a trial. The dates of occurrence (of the index patient encounter) were fairly evenly distributed across the 12 months of the year, with November featuring least frequently (75/1,107 cases, 6.8%) and July featuring most frequently (111/1,107 cases, 10.1%).

Physician-in-training practice characteristics

Of the 1,901 physicians-in-training who were named in civil legal cases during this period, over two-thirds (1,329/1,901, 69.9%) practiced in the province of Ontario. Of 1,901 physicians-in-training named in a civil legal case, there was a subgroup of 951 physicians-in-training (involved in 558 cases) with information available for analysis by specialty and PGY. **Table 2** shows that 55.9% (531/951) were in a surgical specialty training program. Similarly, 41.0% (9,844/24,012) of non-trainee physicians named in a civil legal case were practicing in a surgical specialty **Table 2**. A detailed breakdown of physicians-in-training by subspecialty is provided in the online supplement, which relative to national data (CAPER)[16] suggests an overrepresentation of named physicians-in-training particularly in emergency medicine, obstetrics/gynecology, general surgery, and neurosurgery. (**eTable 3**)

Table 3 summarizes additional practice characteristics for this subgroup of 951 physicians-in-training. Over half of these physicians-in-training (502/951, 52.8%) were on call at the time of the index occurrence. Furthermore, most (725/951,

76.2%) were working on service at the time of the index occurrence. The exception was the group practicing family medicine, which had approximately the same proportion working on service versus not on service (**Table 3**). A greater proportion of these physicians-in-training were in the first 3 years of training (535/951, 56.3%). This finding is not surprising given that most physicians-in-training in family medicine complete their program in 2 or 3 years and family medicine programs have more physicians-in-training than other programs. (**eTable 3**) Nearly one-fifth of the named physicians-in-training (170/951, 17.9%) were clinical fellows. Detailed specialty breakdowns are included in the online supplement. (**eTable 3**)

INTERPRETATION

Our 25-year trend analysis found that the number of CMPA physician-in-training members named in civil legal cases each year has significantly decreased across time. Although the medico-legal risk for physicians-in-training being named in a civil legal threat or legal action is low relative to other physician groups, cases with trainees involved more severe patient harm or death than cases with no trainees.

Cases involving physicians in training can last several years, therefore with 2 to 3-year residencies in Canadian family medicine programs and 4 to 5-year training programs in other specialties civil legal cases could last the entire duration of residency and following completion of their training. The stress caused by an unfavorable patient outcome compounded with medico-legal

matters is potentially detrimental to physicians-in-training; indeed other research has emphasized that residents include added stress from being named in medico-legal litigation as an adverse factor in their clinical practice or the observed practice of others.[20-22]

Based on other research we have conducted,[23] there is evidence indicating that a rising number of Canadian physicians-in-training are calling the CMPA to request medico-legal assistance. The stress experienced either from being named or potentially being named in a civil legal case remains underexplored. In preparing our study, we found a dearth of literature about the perceptions of residents on medico-legal risk.

The onset of a civil legal cases does not necessarily indicate preventable patient harm. Crucially, we wish to acknowledge that this analysis focused on physicians-in-training who were named in a civil legal case, not those who provided sub-standard care. Our subgroup analysis of practice characteristics found that over half of physicians-in-training named in a civil legal case were from the surgical specialties, which was a higher proportion than for non-trainee CMPA members (55.9% versus 41.0%, respectively). These findings confirm that physicians-in-training from surgical specialties are overrepresented in civil legal cases Taken together, this body of research justifies the continued integration of more intensive and/or tailored risk management training as part of ongoing curricula in surgical residencies.

Limitations

We acknowledge several limitations to our study. Some physicians in Canada are not members of the CMPA and not all CMPA members may have requested assistance with their civil legal cases. The physician data reported were not intended for research purposes, therefore we were unable to report on specialty and other practice characteristics for some physicians-in-training. According to CAPER, residents from the province of Québec made up 23.8% of Canadian residency positions between 2008 and 2017.[16] The lack of information regarding the medico-legal experience of the majority of these physicians-in-training leaves us short of claiming a national sample.

Notably, we acknowledge problems defining whether a physician-in-training was working on service or on call at the time of the relevant index encounter. The term on call is defined differently across specialties, particularly in specialties where both supervising physicians and physicians-in-training regularly work overnight shifts (e.g., emergency medicine and critical care medicine). Furthermore, both moonlighting status and mistaken identity were identified only through manual review and are not routinely coded. Therefore, we were not able to exclude these cases from the 25-year trend analysis.

This analysis of civil legal cases is a skewed sample, which we acknowledge to be a critical limitation of our work. These data are not representative of all safety events or preventable harm or negligent care. Our analysis was also not able to adjust for evidence that has shown that litigation tends to be a function of frequency.[24] For example, a surgical trainee may be involved in far more surgical procedures per year then a general surgeon. With these limitations in mind, we

maintain that insights from medico-legal data offer numerous opportunities to make health care safer for patients.

Conclusion

Although the rate of physicians-in-training being involved in a civil legal case has decreased over time and is relatively low, the severity of patient harm and lengthy case durations can have serious, lasting impacts on patients as well as physicians-in-training. We suggest that sharing these data may help physicians-in-training to anticipate and mitigate patient safety risks and to shape their expectations for medico-legal events during postgraduate residencies and clinical fellowships. Further, a raised awareness of medico-legal patterns across specialty areas, in particular, may help stakeholders in postgraduate medical education to focus on areas of priority for addressing medico-legal risk. The role of physicians-in-training in patient safety incidents specifically within the surgical specialties warrants further study.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the following analysts who contributed to data capture, data cleaning, and quality assurance: Anne Steen, Joanna Zaslow, Catherine Bernard, Robin VanderHoek, and Teena Levesque; as well as summer medical students Kyung Joon Mun, Tracy Pham, and Sara Trincao-Batra. The authors further wish to acknowledge additional data provided by Les Forward and Geoff Barnum on behalf of the Canadian Post-M.D. Education Registry (CAPER).

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FIGURES LEGEND

Figure 1. Case inclusion and exclusion flowchart for closed civil legal cases, 1993-2017

Figure 2. Annual number of physicians named in a civil legal case per 1000 CMPA physician members. Cases closed between 1993-2017 (n = 70,412 physicians named in 36,535 cases)

Figure 3. Civil legal case duration and medico-legal outcome for cases involving ≥ 1 physician-in-training, 2008-2017

Table 1. Level of patient harm in medico-legal cases with and without a named physician-in-training; CMPA closed cases, 2008-2017

Level of patient harm	Cases with ≥ 1 named physician-in-training (n = 673)	Cases without a named physician-in-training (n = 6,535)
No harm or asymptomatic	38 (5.6 %)	489 (7.5%)
Mild	268 (40.0%)	3,490 (53.4%)
Moderate	23 (3.4%)	290 (4.4%)
Severe	197 (29.3%)	1,293 (19.8 %)
Death	147 (21.8%)	973 (14.9%)

Table 2. Specialties of CMPA physicians-in-training and non-trainee physicians with population-based frequencies for context; CMPA closed cases and CAPER[1] data, 2008-2017

	Physicians-in-training		Non-trainee physicians	
Specialty area	CAPER national data (n = 50,602)	CMPA physicians-in-training named in a civil legal case (n = 951)[2]	All CMPA non-trainee physicians (n = 121,902)[3]	CMPA non-trainee physicians named in a civil legal case (n = 24,012)
Family medicine	14,469 (28.6%)	84 (8.8%)	51,091 (41.9%)	5,418 (22.6%)
Non-surgical specialties	23,739 (46.9%)	336 (35.3%)	47,086 (38.6%)	8,750 (36.4%)
Surgical specialties	12,394 (24.5%)	531 (55.8%)	20,757 (17.0%)	9,844 (41.0%)

[1] CAPER, the Canadian Post-M.D. Education Registry

[2] Subgroup of named CMPA physicians-in-training that were available for this analysis (i.e., specialty and training level were specified in the CMPA data).

[3] Total also includes 2,968 (2.4%) non-practicing CMPA physician members (not shown) working in an administrative medicine role.

Table 3: Practice characteristics for CMPA physicians-in-training named in a civil legal case, overall and by specialty area[1]; CMPA closed cases, 2008-2017

Practice characteristics	CMPA physicians-in-training named in a medico-legal case (n = 951) [1]	Family medicine (n = 84) [2]	Non-surgical specialties (n = 336)	Surgical specialties (n = 531) [3]
On call				
Yes	502 (52.8%)	35 (41.7%)	243 (72.3%)	224 (42.2%)
No	301 (31.7%)	35 (41.7%)	61 (18.2%)	205 (38.6%)
Unknown	148 (15.6%)	14 (16.7%)	32 (9.5%)	102 (19.2%)
On service				
Yes	725 (76.2%)	37 (44.1%)	250 (74.4%)	438 (82.5%)
No	144 (15.1%)	38 (45.3%)	58 (17.3%)	48 (9.0%)
Unknown	82 (8.6%)	9 (10.8%)	28 (8.3%)	45 (8.5%)
Postgraduate status				
PGY1	175 (18.4%)	40 (47.7%)	64 (19.0%)	71 (13.4%)
PGY2	194 (20.4%)	32 (38.1%)	54 (16.1%)	108 (20.3%)
PGY3	166 (17.5%)	12 (14.3%)	61 (18.2%)	93 (17.5%)
PGY4	123 (12.9%)	0 (0%)	39 (11.6%)	84 (15.8%)
PGY 5-7	112 (11.8%)	0 (0%)	42 (12.5%)	70 (13.2%)
Fellow	170 (17.9%)	0 (0%)	69 (20.5%)	101 (19.0%)

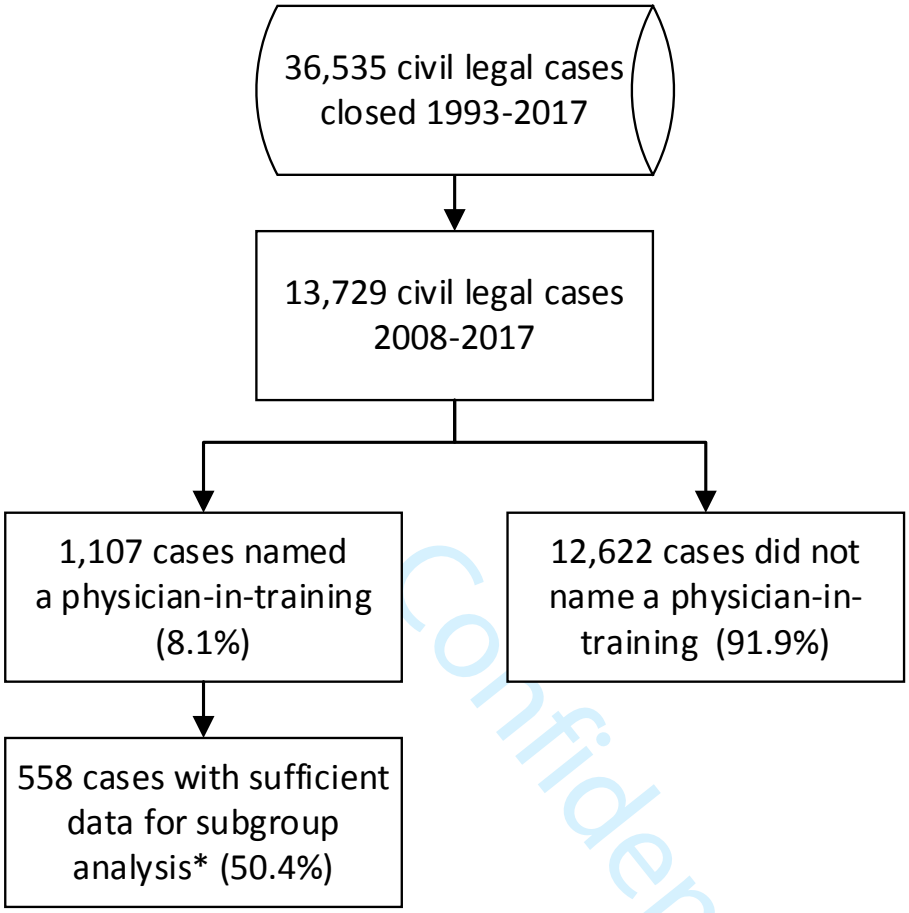
Unknown	11.0 (1.2%)	0 (0%)	7 (2.1%)	4 (0.8%)

PGY, postgraduate year

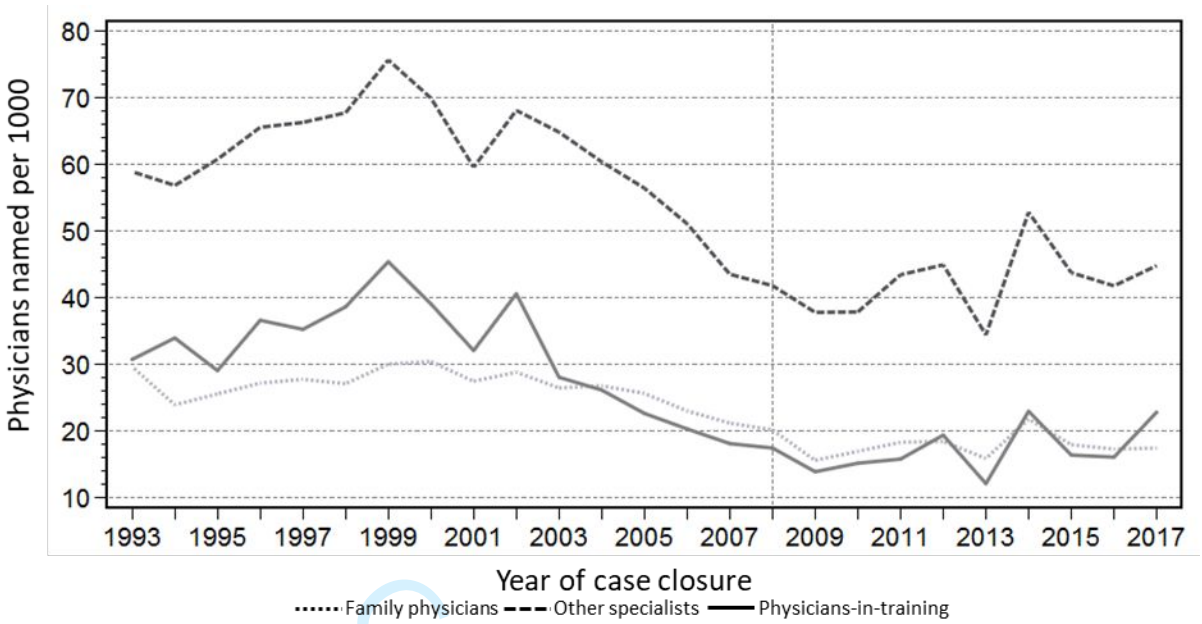
[1] Subgroup of named CMPA physicians-in-training that were available for this analysis (i.e., specialty and training level were specified in the CMPA data).

[2] Family medicine residencies in Canada are 2 years or, sometimes, 3 years in duration.

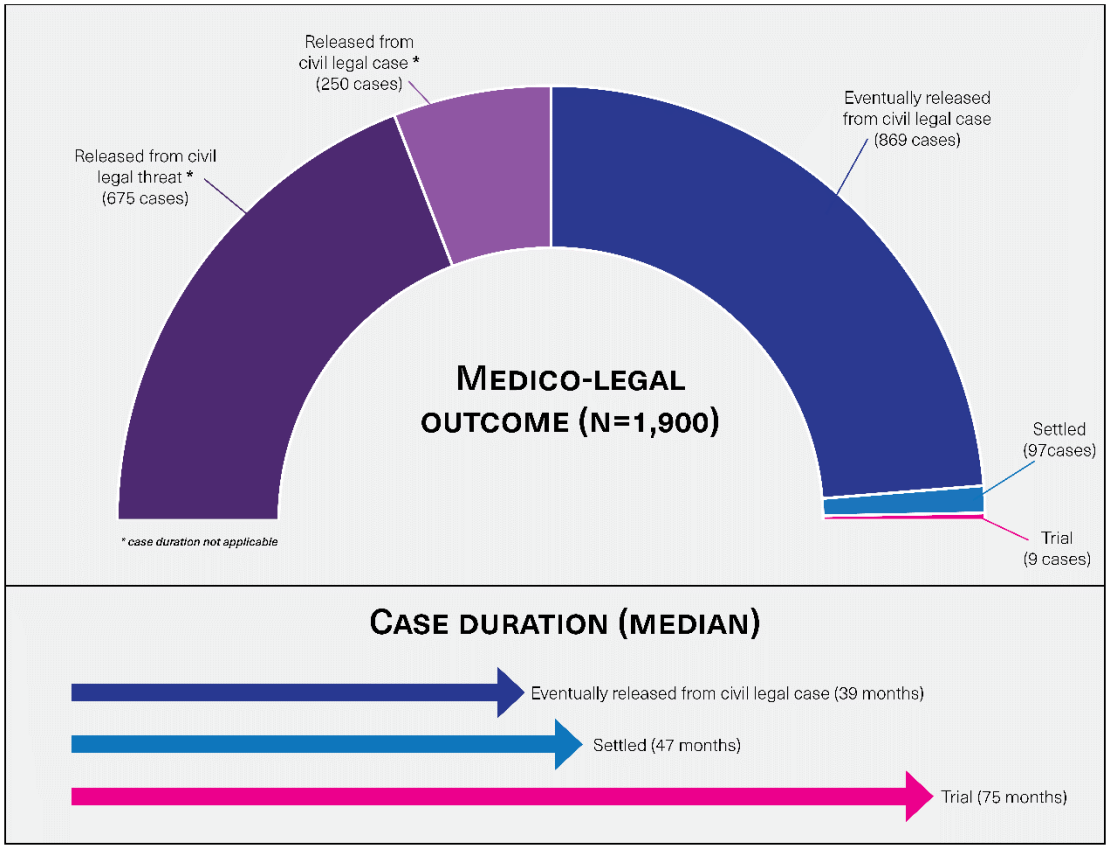
[3] Includes anesthesiology and obstetrics/gynecology



* These are cases with specialty and postgraduate year available for each physicians-in-training



Vertical line at 2008 indicates the cutoff year for case inclusion in analysis of case characteristics


Released from civil legal case * (250 cases)
Eventually released from civil legal case (869 cases)
Released from civil legal threat * (675 cases)
MEDICO-LEGAL OUTCOME (N=1,900)
Settled (97cases)
Trial (9 cases)
* case duration not applicable
CASE DURATION (MEDIAN)
Eventually released from civil legal case (39 months)
Settled (47 months)
Trial (75 months)

ONLINE SUPPLEMENTS

eTable 1. CMPA glossary of medico-legal terms

Term	Definition
Clinical fellow	Qualified specialists from Canada or abroad who were seeking advanced sub-specialty post-graduate clinical training.
Closed case	The status of a case when either a court has determined a legal outcome or the complainant and the physicians have reached a mutual resolution.
Dismissal	A mutual agreement between all parties to end a medico-legal case.
Damages	In law, damages are money paid as compensation for loss or injury.
Date of occurrence	The first date of surgery/procedure/visit/contact with the plaintiff/complainant/other, during which or following which, a complication/untoward event/issue is deemed to have occurred. A medico-legal case may commence months or years after the date of occurrence.
Date of commencement	The first documented date of a civil legal action. Or, in the case of a threat of a civil legal action, the first reported date of the threat.
Date of closure	The documented date of resolution where a medico-legal case is closed (also see **Closed case**).
Fee-region	At the time of this study, the CMPA had established four different fee regions in order to reflect regional variations in medical-legal costs. These regions are: (1) British Columbia and Alberta, (2) Ontario, (3) Quebec, and (4) Saskatchewan, Manitoba, the Atlantic provinces, and the Territories.
Index occurrence	One or more health care interactions that has been described by a plaintiff's statement of claim in a civil legal case.
Named physician	Named physicians are physicians who were included at any point of a litigation, even if released before the conclusion of the case.
Non-trainee physician	Physicians who have completed their postgraduate training.
On service	A working shift within a physician-in-training's own specialty—for example, we considered a general surgery physician-in-training to be on service if they were seeing a patient in the emergency department as part of the general surgery consulting service; we considered a urology physician-in-training to be off service if they saw a patient as part of a general surgery rotation.

Term	Definition
On call	A working shift after standard working hours including evenings, nights, weekends, and holidays.
Peer expert	Physicians retained by parties in the legal actions who interpreted and provided their opinions on clinical, scientific, or technical issues surrounding the healthcare provided and the alleged injuries sustained; typically, of similar training and experience as the physicians whose care they were reviewing.
Physician-in-training	A physician enrolled in a residency program during the index occurrence leading to a civil legal case—this includes *clinical fellows* (see above).
Settlement	An agreement, usually monetary, made between opposing parties in a lawsuit to resolve the legal dispute. A lawsuit can be settled at any stage before or during trial.
Threat	An expression of dissatisfaction with care of physician indicating that a legal claim may be commenced.
Trial	Process of examining evidence and applicable law by a judge and perhaps jury to reach a decision on the merits of a plaintiffs claim.
Unknown outcome	Since CMPA members provide information on a discretionary basis, some cases are closed with an unknown outcome due to incomplete information.

eTable 2. The CMPA's Patient Harm Classification*

Term	Description
Harmful incident	Based on peer expert opinion, the harm resulting from the care or services provided to the patient due to failures in the processes of care or in the performance of procedures, including provider error.
Inherent risk	Based on peer expert opinion, a harmful incident that is a known risk associated with a particular investigation, medication, or treatment. It is the risk from undergoing a procedure in ideal conditions, performed by qualified staff using current research, equipment, and techniques.
Asymptomatic	Patient safety event or patient safety incident** that reached the patient but the patient reports no symptoms and no treatment is required.
Mild harm	Patient harm is symptomatic, symptoms are mild, loss of function or harm is minimal (permanent or temporary), and minimal or no intervention is required (e.g., extra observation, investigation, review, or minor treatment).
Moderate harm	Patient harm is symptomatic, requiring intervention (e.g., additional moderate or minor operative procedure, additional therapeutic treatment), or an increased length of stay, or causing permanent or temporary harm, or loss of function.
Severe harm	Patient harm is symptomatic, requiring life-saving intervention or major medical/surgical intervention, or resulting in a shortening life expectancy, or causing major permanent or temporary harm or loss of function.
Death	Health care-related death

* Adapted from the American Society for Healthcare Risk Management's *Healthcare Associated Harm Level Classification Tool*. [15]

** Patient safety incident: An event or circumstance which could have resulted, or did result, in unnecessary harm to the patient. [25]

eTable 3. Sub-specialties of physicians-in-training with population-based frequencies for context; CMPA closed cases and CAPER data[1], 2008-2017

	Physicians-in-training		Non-trainee physicians	
Specialty area	CAPER national data (n = 50,602)	CMPA physicians-in-training named in a civil legal case (n = 951) [2]	All CMPA non-trainee physicians (n = 121,902) [3]	CMPA non-trainee physicians named in a civil legal case (n = 24,012)
	No. (%)	No. (%)	No. (%)	No. (%)
Family medicine	14,469 (28.6)	84 (8.8)	51,091 (41.9)	5,418 (22.6)
Non-surgical specialties				
Internal medicine	5,931 (11.7)	87 (9.1)	4,564 (3.7)	887 (3.7)
Diagnostic radiology	2,127 (4.2)	36 (3.8)	3,671 (3.0)	1,531 (6.4)
Emergency medicine	931 (1.8)	34 (3.6)9	6,454 (5.3)	2,039 (8.5)
Critical care	NA	27 (2.8)	1,221 (1.0)	255 (1.1)
Neurology	NA	23 (2.4)	1,378 (1.1)	333 (1.4)
Cardiology	NA	22 (2.3)	2,034 (1.7)	462 (1.9)
Psychiatry	2,660 (5.3)	22 (2.3)	7,366 (6.0)	851 (3.5)
Pediatrics	2,126 (4.2)	21 (2.2)	4,009 (3.3)	586 (2.4)
Nephrology	NA	14 (1.5)	781 (0.6)	142 (0.6)
Gastroenterology	NA	11 (1.2)	1,266 (1.0)	329 (1.4)
Other non-surgical specialties	9,964 (19.7)	39 (4.1)	14,342 (11.8)	1,335 (5.6)
Surgical specialties				
Obstetrics/gynecology	1,455 (2.9)	120 (12.6)	3,380 (2.8)	1,916 (8.0)
General surgery	1,940 (3.8)	109 (11.5)	2,460 (2.0)	1,889 (7.9)
Neurosurgery	636 (1.3)	63 (6.6)	376 (0.3)	390 (1.6)
Orthopedic surgery	1,872 (3.7)	61 (6.4)	1,813 (1.5)	1,383 (5.8)
Anesthesiology	2,605 (5.1)	52 (5.5)	4,552 (3.7)	1,032 (4.3)
Urology	658 (1.3)	36 (3.8)	858 (0.7)	429 (1.8)
Otolaryngology	661 (1.3)	24 (2.5)	907 (0.7)	354 (1.5)
Plastic surgery	557 (1.1)	17 (1.8)	792 (0.6)	835 (3.5)
Ophthalmology	931 (1.8)	14 (1.5)	1,521 (1.2)	621 (2.6)
Cardiac surgery	420 (0.8)	13 (1.4)	264 (0.2)	154 (0.6)
Vascular surgery	115 (0.2)	12 (1.3)	265 (0.2)	203 (0.8)
Other surgical specialties	544 (1.1)	10 (1.1)	3,569 (2.9)	638 (2.7)

CAPER, the Canadian Post-M.D. Education Registry. The registry did not report data on several specialties, indicated with "NA".

[2] Subgroup of named CMPA physicians-in-training that were available for this analysis (i.e., specialty and training level were specified in the CMPA data).

[3] Total also includes 2,968 (2.4%) non-practicing CMPA physician members (not shown) working in an administrative medicine role.