Physician factors associated with medical errors in Norwegian primary care emergency services. Based on a case – control study with patient complaints as an outset.

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Research article

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Abstract

Background Patient safety incidents are reported as relatively common. To unravel the reasons for these incidents in primary care emergency units (PCEU), patient complaints have been used as an outset.

Methods We included the PCEUs in ten major cities and rural parts of Norway, covering one third of the population. In the initial part of our study a case-control design was used to evaluate factors related to complaints. The controls were a random sample of three physicians from the same PCEU and time-period as the physician having evoked a complaint. The inclusion period was 18 months (September 1st 2015 till March 1st 2017). The physician characteristics were: gender, seniority, citizenship at authorization and specialty in general practice. Workload was defined as the magnitude of patient contacts. The physician identities and workload were extracted from the medical records from the fourteen-day period prior to the consultation that elicited the complaint. The other variables were obtained from the Norwegian physician position register. In the present study a total of 77 physicians were included in the complaint group and 217 in the random sample group. The assessments of the medical records were divided in three groups: medical error, inconclusive and no medical error. Associations between these groups, physician characteristics and workload, were tested by chi-square, Fisher's exact and t-tests separately for the complaint and randomized group. The data were analyzed using SPSS.

Results In the complaint group 53.2% of the medical records were assessed as being erroneous. In the random sample group this percentage was 3.2. The proportion inconclusive assessments was similar in both groups (29.9 and 27.6%). In the complaint group the percentages for no-error and inconclusive for the female physicians were 30.8 and 15.4; and for the male physicians 9.8 and 27.3, $p=0.027$.

Conclusions In the complaint group male physicians had the lowest percentage no-error, and the highest percentage of inconclusive medical record for assessing medical errors, compared to their female colleagues. The Norwegian regulations for working in a PCEU may have modulated the impact of the other variables. Future research should focus on the underlying elements for these findings.

Background

Patient safety incidents (PSIs) have been defined as any unintended or unexpected incident(s) that could have, or were judged to have, led to patient harm (1). Medical errors are the predominant factor in these incidents. The occurrence of medical errors in primary health care, defined as an actual or a potential serious lapse in the standard of care, is relatively common (2). These errors have been considered preventable in more than 90% of detected cases (1). Out-of-hours consultations are known to be an occupation of high medical risk (3).

Studying medical errors is as challenging as it is to answer the question “What constitutes a medical error?” (4). Considering the potential of health deterioration following medical errors in an emergency situation, learning from these errors is crucial. This may be achieved by user surveys, reporting systems for healthcare and patient complaints (4-6). Reviewing the medical record (e.g. clinical auditing), is mandatory in identifying poor clinical performance (5,7-9). Primary care medical records may often be deficient in describing the complete course of events. Studying unintentional incidents is consequently demanding (1,4,5-9).

In 2006 a Norwegian study of medicolegal assessments of complaints against general practitioners, indicated an association between medical errors and the gender and citizenship of the physician (10). In 2020 we submitted a study on complaints in primary care emergency units (PCEUs) (11). We found that having a GP specialty, or a high workload at the PCEU, significantly reduced the risk of evoking a complaint. Gender, seniority and not having Norwegian citizenship at the time of authorization, were not associated with the risk of evoking a complaint.

In primary health care the physicians may face different and varied working conditions. This includes units with several co-workers and solo practices. Diagnostic errors are reported as most common in primary care solo practice due to workload and inability to cross reference easily with colleagues (4). As this work situation is the regularity in PCEUs in Norway, we have chosen to study the underlying factors for medical errors in these units with patient complaints as an outset.

Little is known about the specific challenges that have to be handled by physicians in the PCEUs, where quick decisions and immediate actions without counselling often are required (4,6). This has induced the hypotheses that communication skills and experience are important factors in minimizing medical errors in these situations. We presume that the perception of being understood, may differ related to the physician's gender and mother tongue (12-14). Increasing experience in terms of training and seniority as a practising physician, should reduce the occurrence of errors. Workload was included expressing the extent of patient contacts.

A complaint may be justified or not, and an error may be proceeded by a complaint or not. This opens up for the use of complaints as an outset to uncover the incidence of medical errors judged to may have lead to patient harm. We have studied a group of physicians who had elicited a complaint and in addition a random sample of physicians. The aim of this study was to examine the associations between characteristics of physicians working in PCEUs, their workload, and the occurrence of medical errors based on the medical records.

Methods

Study setting

Norway has nearly 5.4 million inhabitants and a low population density. In 2018 the number of PCEUs were 177; 75 covering one municipality and 102 covering more than one. Structural and organizational arrangements are underlying factors in studying PSIs. For general practitioners in Norway participating in out-of-hours service is an additional duty to their regular medical tasks (15). The qualification requirements for unrestricted participating in this kind of duty, consist of at least 30 months clinical work after authorization and having had at least 40 duties at medical emergency services provided by primary care units (16).

We decided to include a number of PCEUs covering one third of the Norwegian inhabitants living in urban or rural parts. To reach this we invited ten PCEUs to participate in this project. Six of these units were serving major cities and four were serving mainly rural areas. The chosen units cover approximately 1.7 million people. Based on an Irish study, we stipulated that about 250 patient complaints in total would be received during one year (6).

To facilitate a unified approach to this project, each PCEU was visited twice given oral and written guidelines on inclusion and exclusion of cases. They were also shown the use of a customized computerized data extraction programme for encrypted transmission of data from the medical records. By this data extraction we acquired the unique physician identification number (UPIN) and the parameters on workload during the fourteen-day period prior to the index consultation.

A case-control design was used as an outset to collect information about patient complaints (11). This process was followed by assessments of the medical records for uncovering any medical errors. The case was a physician at a PCEU, evoking a complaint. The controls were three randomly chosen physicians on duty in the fourteen-day period prior to the case consultation. A complaint was defined as any written utterance of discontent with the physician's medical measures, sent directly to the PCEU or via external authorities. The customized computer programme randomly selected three control-physicians for each case-physician. The control-physicians were sourced from the same unit and had been on duty the same or a previous day as the case-physician. Consequently a case-physician could turn up as a control for another case and vice versa.

In the case group the medical record related to the complaint was acquired by the described computer program. As controls the computer randomly selected three medical records written by the three different physicians correlating in time with the case record. The medical records were used for information about the physician characteristics and on workload. For this the UPIN was extracted together with the history of duties with numbers of patients during the fourteen-day period prior to the index consultation. The information extracted from the medical records, was sent encrypted from the project employee to the proprietor of the LSR

(Legestillingsregisteret - Norwegian physician position register). In this way the specified data and the medical records were extracted and made unidentifiable for the research group, meeting the ethical considerations.

The start of data collection was delayed due to necessary adjustments in the customized computer programme. The compliance with the project guidelines on including complaints, varied with no relation between the size of the PCEU and the number of included cases. We prolonged the data collection period from 12 to 18 months. Nonetheless, the result was one third of the anticipated number of 250 complaints. The data collection started September 1st 2015 and was extended to March 1st 2017.

The UPINs were sent encrypted to the LSR. From this register the following information about the physicians was extracted: gender, citizenship (Norwegian vs. non-Norwegian), age at authorization and GP specialty. The LSR does not provide any information on citizenship change. Seniority is defined as number of years after authorization.

For all cases the specified data were accessible in the medical records. The medical history was absent in one record, making the total number in this group 77. For the controls 96.2% of these data were complete. The duty roster at some of the minor units did not have three different physicians to choose from as controls for the fourteen-day period of inclusion. The rest was missing because of incompatibility problems processing data from different systems for electronic medical records used by the participating units. The extractions from LSR reduced the complete data sets in the control group to 92.7%. This was mainly due to unidentifiable UPIN, making 217 medical records in this group available for reviewing.

The medical records in both groups were assessed by the first author (SZB), having 40 years in general practice (GP) with 20 years of experience assessing medicolegal cases. A graded normative tool was used consisting of 13 medicolegal cases, divided in potential harm to patients and considered as no harm. This tool is described in a report from the Norwegian Board of Health Supervision and the Norwegian Medical Association (17). The decision-making process is outlined and the decisive medical factor(s) is presented in fact boxes. In our study the assessments were divided according to this normative tool into three categories: medical errors that may have led to harm, or been disadvantageous, to the health of the patient, inconclusive and no detectable medical error of significance (1). The phrase "may have lead to" reflects the fact that no objective post-encounter information was gathered, and is in agreement with the Norwegian legislation on reprimanding physicians in medicolegal cases (18). In this context inconclusive means shortage of information in the medical record in a way that did not make it defensible to conclude if a medical error had occurred. One of the coauthors (KS) with 30 years in GP was consulted in cases of ambiguity.

Variables

The following characteristics regarding the physicians were used: gender, seniority, citizenship at authorization and specialty in GP. Seniority was defined as number of years after authorization. Workload at the PCEU was defined as the extent of patient contacts. The physician identities and workload were extracted from the medical records from the fourteen-day period prior to the consultation that elicited the complaint. The other characteristics were obtained from the LSR. The assessments of the medical records were divided into three groups: medical error, inconclusive and no medical error.

Workload was calculated as number of patients divided by number of duties, and was grouped into five categories. The first category consisted of those having no duty during the fourteen-day period prior to the index consultation. The remaining four categories were divided into quartiles defining workload: Low (1 to <6.6 no. of patients/no. of duties), Medium low (6.6 to < 8.7), Medium high (8.7 to < 12.0) and High (12.0 and higher).

Statistical analyses

Numbers, percentages, means and standard deviations (SD) were provided to describe the data. Associations between assessment of errors, the characteristics of the physicians and workload were tested by chi-square, Fisher's exact (concerning workload due to low numbers) and t-tests. The tests were done separately for the group that evoked a complaint and for the random sample. The data were analyzed using SPSS (Version 25). Level of significance was set to $\alpha=0.05$.

Human subjects review

The data collection was subjugated to ethical considerations, and consent was obtained to retrieve personal sensitive information from the medical records (2013/99/REK vest - Regional Committee for Medical and Health Research Ethics West). This approval gave access to the medical records with the UPINs, and thereby the parameters on workload. Through this approval the register data in the LSR were made available by the proprietor. All transmission of information was encrypted using Secure File Transfer Protocol.

Results

Table 1 shows the distribution of the three assessment categories. In the group of physicians having evoked a complaint, 53.2% of the medical records were classified as disclosing medical error that may have led to harm, or been disadvantageous, to the health of the patient. In the random sample group this percentage was 3.2. The proportion inconclusive was similar for both groups (29.9 and 27.6%). No-error was the conclusion for 16.9% in the complaint group. In the random sample group this percentage was 69.1.

The distribution of assessments of the information in the medical records by physician characteristics and workload, are presented in Table 2 for the complaint and in Table 3 for the control group. In the complaint group male physicians had the lowest percentage no-error (9.8%), and the highest percentage of medical records assessed as inconclusive (37.3%), compared to female physicians, $p=0.027$. No significant differences were found in the two groups for the other variables, including detection of medical errors.

Discussion

In this study on medical errors in PCEUs in Norway patient complaints have been used as an outset. A group of complaint evoking physicians and a random sample of physicians from the same PCEU and time period, were analyzed. In assessing the content of the medical records, the essential finding was the significance of the gender of the physicians. Male physicians in the complaint group were judged to have the lowest proportion of no-error and the highest proportion of records being inconclusive for management assessments compared to their female colleagues. Inconclusiveness was considered when incomplete documentation was detected without judging the deficiencies as crucial for assessing the medical performance.

Physician training expressed by seniority or GP specialty, did not have significant implications. Neither did we find any association between medical errors and any of the chosen variables. This is partly unlike the findings in our study on patient complaints, where having GP specialty or a workload of more than one duty in the fourteen-day period, significantly reduced the risk of complaint evoking (11). As complaints and errors may be considered complementary or supplementary, the lack of concurrence in the results of our studies is surprising. However, as a complaint is written in retrospect, the medical record should be the basis for the assessments. The physician's attitude may induce a complaint. In this study complaints on physician's behaviour were not included.

A conceivable reason for not confirming the advantageous effect of the GP specialty, may be the overall effect of the Norwegian qualification requirements for unrestricted working in a PCEU (16). In addition to this a course on emergency medicine has since 2012 been required for being qualified as a GP specialist (16). This may be of decisive importance while 57.6% of the physicians in the random sample group had this specialty, and the additional number of physicians in training for being qualified is unknown.

The effect of structured training is well known (2,24,25). In this line it should be expected that the experience caused by increasing seniority, may have the protective function against medical errors. Nevertheless, studies have shown that increasing seniority increases the incidence of medical errors (13,14). The reason for the lack of this effect in our study, may once again be the Norwegian system requiring a post-educational program for unrestricted working in a PCEU (16).

Being on-call is about getting to know the specific professional issues, acquiring the appropriate knowledge on facilities and co-working. In this way a high workload has been shown to act as training for the physicians, thereby providing a protection against complaint evoking (11). In this context it should be expected that having more than one duty during a fourteen-day period, would achieve the effect of training. This effect is not reached in this study on medical errors.

Language skills and cultural competence have been shown as a prerequisite for satisfactory communication, avoiding unfortunate events (12,13). Physicians not having a Norwegian citizenship, may have their communication skills influenced by their mother tongue and a diverging approach on cultural basis in communicating with patients. Nevertheless, in studying patient complaints, citizenship did not seem to be of importance (11). These compatible results for physicians with or without Norwegian citizenship, may once more be explained by the Norwegian prerequisites for working in a PCEU and the required course on emergency medicine for getting qualified as a GP specialist (16). The consequence of these regulations coincides with the results of a study including graduates from foreign versus US medical schools, showing better patient outcome with graduates from foreign schools (26). This is explained by a rigorous approach to incorporate international medical graduates.

It is intriguing that for only 53.2% of the patients in the complaint group a medical error was uncovered. This is consistent with a Norwegian study on medicolegal assessments (10). However, this does not support an assertion that nearly half of the complaints were unfounded. In the same way disclosing sparse recording does not necessarily lead to the conclusion that the medical measures have been erroneous. As medical records in PCEUs often will not document the complete course of events, this inconclusiveness may be hiding deficiencies in managing the patients. These deficiencies may be seen as the main reason for the proportion of medical records assessed as inconclusive in this study, i.e. making it inadequate to decide whether or not a medical error could have or had led to patient harm. The finding that only 3% of the medical records in the random sample group revealed medical errors, is consistent with larger studies from primary health care (1,8). The low sample size does not allow any statistical assessments for this group.

The proportion of inconclusive medical records was similar in the complaint and the random sample group (29.9 and 27.6%). The gender difference exclusively related to no-error and inconclusive assessments, may be explained by female physicians being more thorough in journaling.

Further research is needed on disclosing the course of actions in managing patients in PCEUs. This means studying the underlying elements in the physician's considerations and decisions documented in the medical record. Hereby including any additional notes revealing information that might have been available to the physician.

Strength and limitations

The strength of this study is that it is based on a case-control design with a proper random sample group with valid and nearly complete data sets. The proportion of inconclusive medical records was similar in the complaint group and the random sample group (29.9 and 27.6%). This substantiates the assumption of consistency in the assessments of the medical records in the two groups. Knowing about the complaints does not seem to have influenced the judgements. The use of a normative tool, facilitated consistency in reviewing the medical records (17).

The main weakness of the study is the unexpected low number of medical records included. There were different reasons for this low number: compatibility problems with the customized data extraction programme and the different electronic medical record systems, changing leadership during the study period at some PCEUs together with heavy workload. The lack of electronic compatibility was the essential reason for one of the larger units. Broad scale extraction of textual material from different electronic medical record systems, is at present still not possible. The low number of medical records create limitations on the application of the results of this study.

As smaller units with rather few participating physicians were included, the frequency of duties increases the probability to be picked up as a control more than once. This may be a bias in this study, reflected by the lower number of individual physicians than should be expected from the number of cases. This does not seem to have influenced the results.

Conclusions

In studying factors that may induce medical errors in PCEUs in Norway, medical records written by two groups of physicians were reviewed: a group of physicians having evoked a complaint and a random sample of physicians. The only significant results were found in the complaint group. A gender difference was disclosed. The male physicians had a lower proportion of medical records assessed as no-error, while inconclusive medical records were detected in a higher proportion, than among their female colleagues. Physician gender, seniority, citizenship, GP speciality or workload did not influence inducing medical errors. The Norwegian regulations on working in a PCEU, may have modulated the results. Future research should focus on the underlying elements for these findings.

Declarations

Keywords

general practice, emergency medical services, medical errors, medical audit, case control study

Competing interests

The authors declare no potential, perceived, or real conflicts of interest.

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Tables

Table 1 Assessments of medical errors in ten primary care emergency units in Norway, 2015-2017. A case-control study of complaints was used as an outset.

Variables	Complaints		No-complaints		Total	
	Cases		Controls			
	n	(%)	n	(%)	n	(%)
Medical error	41	(53.2)	7	(3.2)	48	(16.3)
No error	13	(16.9)	150	(69.1)	163	(55.4)
Inconclusive	23	(29.9)	60	(27.6)	83	(28.2)
	77		217		294	

Table 2 Assessments of medical errors in ten primary care emergency units in Norway, 2015-2017.

A case-control study of complaints was used as an outset. Group of complaints.

Assessments of medical records										
Variables	Medical errors			No errors			Inconclusive			p-value
	n	%	Mean(SD)	n	%	Mean(SD)	n	%	Mean(SD)	
Gender										
Female	14	53.8		8	30.8		4	15.4		0.027
Male	27	52.9		5	9.8		19	37.3		
Seniority			8.7 (9.3)			4.3 (3.2)			8.4 (8.3)	0.242
Specialty general practice										
Yes	11	52.4		4	19.0		6	28.6		0.951
No	30	53.6		9	16.1		17	30.4		
Citizenship at authorization										
Norwegian	28	56.0		7	14.0		15	30.0		0.636
Non-Norwegian	13	48.1		3	22.2		8	29.6		
Workload ¹										0.638 ²
Only one duty	16	57.1		5	17.9		7	25.0		
Low	9	69.2		1	7.7		3	23.1		
Medium low	3	30.0		3	30.0		4	40.0		
Medium high	3	33.3		2	22.2		4	44.4		
High	10	58.8		2	11.8		5	29.4		

¹ First row the no. for just one duty in the fourteen day period. The following four rows has the quartiles of no. of patients/no. of duties: 1.0-6.6; 6.6-8.7; 8.7-12.0 and >12.0.

² Fischer's exact test

Table 3 Assessments of medical errors in ten primary care emergency units in Norway, 2015-2017.

A case-control study of complaints was used as an outset. Random sample group.

Assessments of medical records										
Variables	Medical errors			No errors			Inconclusive			p-value
	n	%	Mean(SD)	n	%	Mean(SD)	n	%	Mean(SD)	
Gender										0.472
Female	4	4.7		61	70.9		21	24.4		
Male	3	2.3		89	67.9		39	29.8		
										0.549
Seniority			6.3 (5.1)			9.1 (8.2)			11.1 (9.4)	0.192
Specialty general practice										0.065
Yes	3	3.3		56	60.9		33	35.9		
No	4	3.2		94	75.2		27	21.6		
Citizenship at authorization										0.277
Norwegian	4	2.4		112	67.9		49	29.7		
Non-Norwegian	3	5.8		38	73.1		11	21.2		
Workload¹										0.662 ²
Only one duty	2	4.8		26	61.9		14	33.3		
Low	1	2.3		32	74.4		10	23.3		
Medium low	1	2.1		36	76.6		10	21.3		
Medium high	1	2.1		34	72.3		12	25.5		
High	2	5.3		22	57.9		14	36.8		

¹ First row the no. for just one duty in the fourteen-day period. The following four rows has the quartiles of no. of patients/no. of duties: 1.0-6.6; 6.6-8.7; 8.7-12.0 and >12.0.

² Fischer's exact test