An investigation into general practitioners associated with high patient mortality flagged up through the Shipman inquiry: retrospective analysis of routine data

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Abstract

Objective To identify a credible explanation for the excessively high mortality associated with general practitioners who were flagged up by the Shipman inquiry.

Design Retrospective analysis of routine data.

Setting Primary care.

Participants Two general practitioners in the West Midlands who were associated with an unacceptably high mortality of patients during 1993-2000.

Main outcome measures Observed and expected number of deaths and deaths in nursing homes.

Results Preliminary discussions with the general practitioners highlighted deaths in nursing homes as a possible explanatory factor. No relation was found between the expected number of deaths and deaths in nursing homes in each year during 1993-2000 for either general practitioner. In contrast, the magnitude and shape of the curves of a cumulative sum plot for excess number of deaths (observed minus expected) in each year were closely mirrored by the magnitude and shape of the curves of the number of patients dying in nursing homes; and this was reflected in the high correlations ($R^2 = 0.87$ and 0.89) between excess mortality and the number of deaths in nursing homes in each year for the general practitioners. These findings were supported by administrative data.

Conclusions The excessively high mortality associated with two general practitioners was credibly explained by a nursing home effect. General practitioners associated with high patient mortality, albeit after sophisticated statistical analysis, should not be labelled as having poor performance but instead should be considered as a signal meriting scientific investigation.

Introduction

After the crimes of Dr Harold Shipman, the UK government set up an independent inquiry.^{1 2} Important issues for the inquiry were the suggestion that a statistical analysis of Shipman's data on patient mortality could have spotted his activities earlier and the recommendation that death rates in general practice should be routinely monitored.^{1 3-5}

The Shipman inquiry commissioned an independent research team from Imperial College, London, to consider the monitoring of death rates in general practice. The team showed that such monitoring was feasible and tried its preferred statistical method of cumulative sum plots in a pilot study.^{4 6} This plot, which in essence is an accumulation of the standardised differences between observed and expected numbers of deaths, takes account of several sources of variation, including chance, patient case

mix, seasonality, and systematic (but unknown) sources of variation. When the plot crosses a statistically predefined threshold, which is akin to a significant P value with allowance for multiple testing, it is said to have "signalled" an "unacceptably" high mortality that seemed to implicate quality of care. In the pilot study, involving a sample of 1009 general practitioners from five health authorities, cumulative sum plots highlighted 12 general practitioners associated with unacceptably high patient mortality who merited investigation.^{4 6} One of the general practitioners was Shipman. As for the rest, the UK Department of Health wrote to the appropriate health authority or primary care trust and requested an investigation of the high mortality. We investigated two general practitioners associated with high patient mortality who were in the West Midlands, our area of responsibility. We sought to identify a credible explanation for the associated high death rate.

Methods

We adopted the pyramid of investigation model (fig 1).³ This model checks five variables—data, patient case mix, structure, process of care, and carers. We began with a review of the data. The general practitioners (A and B) were made aware of, and fully cooperated with, the investigation.

Through the Shipman inquiry we obtained the raw data on mortality for the general practitioners and the analyses conducted on these data by the team from Imperial College, whose methods are fully described elsewhere.^{4 6} Briefly, their raw data consisted of a list of the deceased patients for each general practitioner,

Fig 1 Pyramid model of investigation to find credible cause for high mortality of patients

with personal details (date of birth, sex, postcode) and date, place, and cause of death. Their analyses included a count of observed and expected numbers of death for each year from 1993 to 2000 together with the cumulative sum plots. The expected numbers of deaths were determined using indirect standardisation adjusted for patients' age, with reference rates being derived from the relevant health authority. The cumulative sum plots were designed to detect general practitioners associated with a patient mortality of at least 4 standard deviations higher than the acceptable level. The threshold for signalling an alarm was set at 3, which was almost certain (>99.9%) to indicate a true signal (fig 2, top). The cumulative sum plots for general practitioners A and B crossed the alarm threshold in 1996.

We used the codes for place of death in the raw data to determine the address of the place of death through the Office of National Statistics Communal Establishment File. The table shows the data obtained from the Shipman inquiry.

We undertook the generation and testing of an exploratory hypothesis using the raw and adjusted

data. From these we sought specific items of data, analysis, or information that could be used to test the validity of the hypothesis.

Results

Generation of hypothesis

After preliminary discussions with general practitioners A and B and the local lead for underperformance of general practitioners (AR), it was apparent that there had been no major dissolutions in practice, epidemics, or changes in boundaries in the areas served by the general practitioners during 1993-2000. It was known, however, that in 1996 (the year the alarm threshold was crossed) general practitioner A had taken on substantial nursing home commitments and that general practitioner B was practising in a catchment area with several nursing homes. We sought to test the "nursing home effect" as our preliminary working hypothesis.

Testing the hypothesis

We undertook several analyses. Firstly, we compared the excess (observed minus expected) mortality with

Fig 2 Cumulative sum plots for general practitioners A and B, with alarm threshold set at 3, (top) deaths in nursing homes compared with excess and expected deaths (middle), and XY scatter plot of deaths in nursing homes compared with excess deaths (bottom)

Data on patient mortality associated with general practitioners A and B during 1993-2000

General practitioner and year	No of deaths		No (%) of deaths in nursing home	List size
	Observed	Expected		
A:				
1993	12	14.14	4 (33)	2392
1994	29	13.76	10 (34)	2437
1995	36	14.97	25 (69)	2252
1996	38	14.02	24 (63)	2200
1997	37	13.70	25 (68)	2131
1998	29	13.85	19 (66)	2096
1999	14	11.00	2 (14)	2022
2000	10	11.46	3 (30)	2270
B:				
1993	15	7.77	6 (40)	1204
1994	20	8.58	13 (65)	1274
1995	32	9.66	23 (72)	1382
1996	38	15.29	28 (74)	1504
1997	51	15.87	40 (78)	1514
1998	57	31.30	31 (54)	3137
1999	38	29.66	20 (53)	2966
2000	40	25.54	17 (43)	2821

the number of deaths in nursing homes for each general practitioner (fig 2, middle). The shape and magnitudes of these variables for both general practitioners were apparently similar, which suggested that the excess mortality was attributable largely to deaths in nursing homes. We tested the relation between the excess mortality and deaths in nursing homes for each general practitioner using an XY scatter plot and found high correlation coefficients of 0.89 (general practitioner A) and 0.87 (B) using a best fit least squares line not constrained through the origin (fig 2, bottom).

We also explored the relation between expected numbers of deaths and deaths in nursing homes (fig 2, middle). The expected numbers of deaths associated with general practitioner A seemed to be insensitive to the number of deaths in nursing homes; for general practitioner B, however, there seemed to be some relation, which on closer inspection was confounded by the substantial increase in the list (for example, in 1998 the list size doubled as did the expected number of deaths; table).

Administrative records showed that throughout 1993-2000, general practitioner A's practice was responsible for two nursing homes and that A was responsible for care in both (1993-2000 for one, 1992-1998 for the other). During 1993-2000 general practitioner A would therefore have been the practice doctor who signed off the most certificates for deaths in the nursing homes. The relinquishment of one of the nursing homes in 1999 is associated with a substantial decrease in the percentage of deaths (66% in 1998 compared with 14% in 1999; table).

Administrative records for general practitioner B's practice showed that in 1993 the practice was responsible for two nursing homes. In 1994 the practice took on a nursing home. In May 1995 the practice took on yet another nursing home, which was relinquished in October 1997. In 1998 the senior partner retired and general practitioner B took on his list (1514 patients in 1997 compared with 3137 patients in 1998; table). Before 1997, general practitioner B had sole responsibility for one nursing home and from 1997 had

responsibility for three. The percentage of patients who died in nursing homes increased from 40% in 1993 to 65%-72% in 1994 and 1995 when the practice took on an extra nursing home and decreased from 78% in 1997 when a nursing home was relinquished to 54% in 1998 (table).

Discussion

Our visual analysis of a limited dataset from the Shipman inquiry supports a "nursing home effect" for the high mortality of patients associated with certain general practitioners. We believe that our findings are credible on the basis of a graphical model, which combined the results of local knowledge, administrative data, and reported findings that patients admitted to a nursing home are known to have high mortality.^{7 8}

Apart from the two general practitioners we investigated, we are aware of six others who also signalled "unacceptably" high patient mortality through the Shipman inquiry and whose investigations have been reported (A Rixom, personal communication, 2004).⁹ All six were subsequently found to have a nursing home effect. The reports describe a complex investigation process, which included several strategies encompassing quantitative and qualitative data in combination with an independent review of case notes. It remains unclear as to how useful the review of case notes was in these instances, although the methodological issues as well as time and cost are considerable.^{9 10} Nevertheless, our findings along with those of others, suggest a need for a replication of our analysis for the other nine general practitioners who also signalled "unacceptably" high mortality, and that the model of adjustment for case mix on which the cumulative sum plots are based may need to be refined to accommodate adequately the nursing home effect. We also perceive a need to monitor mortality in nursing homes independently.

An important implication of our finding is caution in over-interpreting data adjusted for case mix, which has been described as the case mix adjustment fallacy.¹¹ This fallacy begins with a deceptively simple equation that relates the variance in outcomes (mortality) to a combination of three sources—chance, patient case mix, and quality of care. Sophisticated statistical techniques are often used to account for chance, both in measured and, in this case, unmeasured (by taking account of over dispersion in observed deaths) patient case mix factors, with the residual unexplained variance being prematurely assigned to quality of care.⁴ We have shown that such reasoning, although seductive, should be diligently avoided if the process of monitoring is to remain a credible and positive contribution to improving quality of care.¹² A general practitioner associated with high patient mortality, albeit after a sophisticated analysis, should not be labelled as having poor performance but instead should be considered as meriting proper scientific investigation for a credible cause. If a national monitoring system is implemented, the need for local knowledge and expertise in interpreting the data should not be underestimated.

We thank general practitioners A and B for their cooperation and support throughout this work, the staff involved with the Shipman inquiry, Paul Aylin (Imperial College, London) for

What is already known on this topic

After statistically sophisticated analyses, the Shipman inquiry was notified of 12 general practitioners (one being Harold Shipman) with excessively high mortality

Several of the 11 general practitioners have been investigated, mostly using the costly and challenging method of case note review

What this study adds

A "novel" pyramid model of investigation was applied to two general practitioners associated with unacceptably high patient mortality

The excess mortality is adequately explained by taking account of the proportions of patients dying in nursing homes

Competing interests: MAM was an expert witness at the Shipman inquiry, where he discussed the monitoring of death rates associated with general practitioners.

Ethical approval: Not required.

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Contributors: AR headed the investigation team. DP and HO carried out data validation checks and exploratory analysis. PM was part of the investigation team and provided guidance and support throughout and was our link with the Department of Health and the team at Imperial College, London. MAM provided a framework for the investigation, undertook analysis of the dataset from the Imperial College team, found the results shown, and wrote the first draft of the paper. AS provided guidance and support throughout. All authors contributed to the writing of the final paper. MAM will act as guarantor for the paper.

A memorable patient

My first case

They didn't have preregistration house officers in my day. You passed your finals, got yourself registered, and looked for a job. Straight in at the deep end. Which was how I came to be sitting in the medical residents' lounge of a north London hospital late in February 1940. It was Sunday night, and I was due to start work next morning as junior house surgeon to the outpatients and casualty departments. We had just finished dinner when Casualty rang up for a doctor. My predecessor was packing, and the other two, more senior residents were about to go out, so I offered to go down.

I was met by the night sister and a police sergeant with his attendant constable. The story was that two youths, one with a pistol, had burst into the private bar of the local pub and demanded the contents of the till. The barmaid had grabbed a bottle and struck out. The gun went off, and the girl was killed instantly. The youths escaped, leaving the gun. The sergeant required formal confirmation that the girl was dead.

Sister took me into a side ward, where a body lay covered with a sheet. I drew it back to reveal a beautiful naked young woman with rich curling chestnut hair down to her shoulders and bright blue eyes staring at the ceiling. "Was she very soiled when they brought her in?" I asked sister.

"Yes, I'm afraid so," she said. "You know how it is with violent deaths." I didn't, but I let that pass.

It didn't take long to find the wound. Under the left breast, right on the pale pink crease was a black spot, no bigger than the end of a pencil. "Any bleeding, sister?"

"No, doctor, just a little oozing round the edges of the wound.

"I'm not surprised," I said. "The slug would have gone between those two ribs and straight into the heart. I guess she'd have died

at once from shock even before the brain gave up from loss of oxygen."

"Would she have felt anything, doctor?"

"I doubt it. Maybe a thump for a split second, but no real feeling of pain, I hope."

I closed her eyes, lifted with one finger a lock of that amazing hair to see the copper sheen flash in the neon light, folded her arms across her chest, drew up the sheet again. I had a vivid mental image of a furious red headed girl, arm stretched up, bottle in hand, screaming—then "Crack" as the gun went off.

"If only she hadn't been left handed," I muttered, "she might, just might have had a chance." Sister looked puzzled, but I hadn't the heart to explain.

I signed the sergeant's piece of paper and set off to walk back to the mess. It was a bright starlit night. I could hear a faint droning noise over to the east, and sure enough just then the sirens started up. "What a waste," the sergeant had said.

"Yes," I'd replied, "a dreadful wicked waste." But all that was before Dunkirk, of course.

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We welcome articles up to 600 words on topics such as *A memorable patient*, *A paper that changed my practice*, *My most unfortunate mistake*, or any other piece conveying instruction, pathos, or humour. Please submit the article on <http://submit.bmj.com>. Permission is needed from the patient or a relative if an identifiable patient is referred to. We also welcome contributions for "Endpieces," consisting of quotations of up to 80 words (but most are considerably shorter) from any source, ancient or modern, which have appealed to the reader.