EVIDENCE BASED PUBLIC HEALTH POLICY AND PRACTICE

How did general practitioners protect themselves, their family, and staff during the SARS epidemic in Hong Kong?

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Context: Severe acute respiratory syndrome (SARS) is a newly emerging infectious disease and how the frontline community doctors respond to it is not known.
Objectives: To explore the impact of SARS on general practitioners (GPs) in Hong Kong.
Design: A cross sectional survey.
Setting: Community based primary care clinics.
Participants: 183 family medicine tutors affiliated with a local university. Postal survey sent to all tutors with a 74.8% response rate.
Main outcome measures: Change of clinical behaviour and practices during the epidemic; anxiety level of primary care doctors.
Results: All agreed SARS had changed their clinical practices. Significant anxiety was found in family doctors. Three quarters of respondents recalled requesting more investigations while a quarter believed they had over-prescribed antibiotics. GPs who were exposed to SARS or who had worked in high infection districts were less likely to quarantine themselves (10.8% versus 33.3%; $p<0.01$; 6.5% versus 27.5%; $p<0.01$ respectively). Exposure to SARS, the infection rates in their working district, and anxiety levels had significant impact on the level of protection or prescribing behaviour.
Conclusion: The clinical practice of GPs changed significantly as a result of SARS. Yet, those did not quarantine themselves suggesting other factors may have some part to play. As failure to apply isolation precautions to suspected cases of SARS was one major reason for its spread, a contingency plan from the government to support family doctors is of utmost importance. Interface between private and public sectors are needed in Hong Kong to prepare for any future epidemics.

The severe acute respiratory syndrome (SARS) has taken the world by surprise and caught the medical professionals off guard. As of 1 July 2003, there were 8445 reported cases resulting in 812 deaths in 31 countries worldwide.[1] Hong Kong, having identified the first case on 22 February 2003, received a severe blow with 1755 confirmed cases and a death toll of 298 people.[1]

As SARS is a suddenly emerging infectious disease associated with significant morbidity and mortality, it has caused serious anxiety among the general public and health professionals. To combat this outbreak, the Hong Kong authorities and other international agencies announced a number of measures and guidelines mainly targeted at the general public, vulnerable, or high risk groups such as travellers and hospital staff.[2] GPs who are at the forefront of diagnosing SARS and dealing with patients and families affected by it, were largely left to their own device. This situation is further complicated by the health set up in Hong Kong where primary care works independently from the rest of the healthcare system. Therefore, GPs do not have any immediate and rapid access to the investigation facilities of the hospital authority (HA) hospitals.

Eight community doctors (including one dentist) have contracted SARS with two subsequent deaths and at least one family member of these community doctors was infected.[3] Such news was likely to lead to increased anxiety and possibly had changed the clinical practices of community doctors. This study aimed to explore the anxiety levels of GPs, the effects of SARS on their quality of life during the epidemic, and the precautions they had taken to protect themselves and, their family and staff. We examined if and how their clinical practice in relation to doctor-patient relationship, physical examination, investigation, prescribing, and secondary referrals had been affected by this outbreak.

METHODS

The impact of the SARS survey comprises five sections: demographic data, training for SARS, anxiety scale, clinical practices, and use of screening tools (a copy of the questionnaire is available from the authors). The anonymous survey was sent to all family medicine tutors affiliated with the Chinese University of Hong Kong at the end of May after the removal of WHO recommendation of postponing all essential travel to Hong Kong. A reminder with a copy of the questionnaire was posted again in the middle of June. All returned questionnaires on or before 3 July were entered for a lucky draw of a supermarket coupon (equivalent to US$40) and the data onto the computer using SPSS for further analysis.

We calculated the proportion of GPs exposed to SARS and correlated their anxiety levels measured by scales with a low score indicating high anxiety in the probable SARS exposed and non-exposed groups (definition according to WHO guidelines[4]) and, in the high and low infection districts (defined as more than 300 buildings with probable cases between 12 April and 27 May). We looked at the frequencies of various clinical practices as well as precautions they undertook to protect themselves, their family, and staff. To examine effects of demographic characteristics, we stratified raw cross tabulations by sex, age (young 26–40; middle aged 41–55; old 55–70), and the nature of the clinics (solo or group, private, or government).

RESULTS

A total of 192 questionnaires were sent off in the first instance and seven returned because of the wrong address or persons not found. After updating our record, 185 questionnaires were sent again three weeks later and this time two were returned to the sender. Therefore, a total of 183 questionnaires were sent to our tutors with 137 valid replies (74.8%). Table 1 shows the characteristics of the respondents compared with those of our tutors from our record. In our sample, 84 (61.3%) respondents have diagnosed either suspected (275) or probable (72) SARS cases from the community and 32 worked in districts with a high infection rate.

Anxiety level

On a scale of 10, the anxiety scores were less than 5 (midpoint) in all parameters with worry about the family (3.44) achieved the lowest score (table 2). Female doctors were more worried about infecting their families (2.16 versus 3.67; $p<0.05$) and perceived high anxiety as a source of infection by their families (3.16 versus 4.69; $p<0.05$) whereas young and middle aged doctors found their quality of life more affected than their older colleagues (3.67 and 3.35 versus 5.55; $p<0.05$). However, exposures to SARS and working districts had no impact on their anxiety levels.

In the SARS exposed group, those who were frightened of dealing with SARS correlated more strongly with worries about infecting their family ($r = 0.67$; $p<0.001$) and effects on quality of life ($r = 0.57$; $p<0.001$) when compared with those of the non-exposed groups ($r = 0.56$ and 0.36 respectively; $p<0.01$).

Clinical practices

Nearly all doctors admitted that SARS had changed their clinical practices and the order of frequencies of different practices is shown in table 3. Overall 97.7% of doctors said they had worn masks all the time, but a third did not wash their hands after seeing/ examining a patient, half were not wearing gowns, and three quarters not wearing goggles during patient encounters. Noticeably, three quarters of the doctors recalled requesting more blood tests or radiographs and nearly a quarter of them believed they had over prescribed antibiotics. Just over half of the doctors insisted patients wearing masks during consultations, about a third of the doctors reported keeping greater distance from the patient. A considerable number of doctors (15.6%) spent less time with patients while a few (7.4%) avoided physical examinations. Only 10 doctors (12.4%) who diagnosed either suspected (1) or probable (9) SARS had closed their clinics (mean 10.6 days).

For those working in high infection districts, they were more likely to wear gowns and have closed their clinics (63.0% versus 42.0% and 15.2% versus 3.7% respectively; $p<0.05$). In the SARS exposed and highly anxious doctors (those scored below 4.7 in the item: frightened of dealing with SARS as a frontline doctor), they were more likely to insist patients wearing masks (65.1% versus 48.1% and 68.1% versus 48.5% respectively; $p<0.05$) whereas the SARS exposed doctors tended to over prescribe antibiotics (30.1% versus 15.4%; $p<0.05$) (table 3). Public doctors were more likely to wear gowns during consultation (81.3% versus 45.3%; $p<0.05$), have more specialist appointment postponed or cancelled (37.5% versus 13.7%; $p<0.01$), and found themselves seeing patients at a faster pace (56.3% versus 10.3%; $p<0.01$).

Protecting staff

Nearly all (97.8%) support staff wore masks but only a quarter had worn disposable gloves and had their temperature

Table 1 Comparison of demographic characteristics of the respondents and the tutors

	Respondents		Tutors		χ^2
Demographic characteristics	**N**	**(%)**	**N**	**(%)**	**p Value**
Number of doctors	137		183		
Mean (SD) age	44.4 (9.4)		NA		NA
Age group					
Young (25–40)	49	(36.0)	NA		NA
Middle (41–55)	71	(52.2)	NA		
Old (56–70)	16	(11.8)	NA		
Gender					
Male	112	(82.4)	155	(84.7)	0.57
Female	24	(17.6)	28	(15.3)	
Place of primary medical education					
Hong Kong	97	(72.4)	130	(71.0)	0.94
Western	30	(22.4)	42	(23.0)	
Non-HK and non-Western	7	(5.2)	11	(6.0)	
Postgraduate qualification					
Yes	119	(87.5)	157	(85.8)	0.66
No	17	(12.5)	26	(14.2)	
Years of graduation					
<10	22	(16.3)	35	(19.1)	0.22
11–20	54	(40.0)	65	(35.5)	
21–30	41	(30.4)	69	(37.7)	
>31	18	(13.3)	14	(7.7)	
Professional experience					
Experienced	106	(77.9)	148	(80.9)	0.52
Inexperienced	30	(22.1)	35	(19.1)	
Primary practice setting					
Solo practice	92	(67.6)	114	(62.3)	0.003
Group practice	25	(18.4)	18	(9.8)	
Community health centre	19	(14.0)	51	(27.9)	
Type of clinic					
Private	119	(87.5)	NA		NA
Public	13	(9.6)	NA		
NGO	3	(2.2)	NA		
Both private and public	1	(0.7)	NA		

NA, not available.

Table 2 Anxiety levels scored by different groups of doctors

	Frightened of dealing with SARS as frontline doctor		Worried about infecting family because of job		Family worried about being infected by them		Impact of SARS on quality of life	
		Analysis of variance		Analysis of variance		Analysis of variance		Analysis of variance
Variables	Mean	p Value	Mean	p Value	Mean	p Value	Mean	p Value
Overall	4.7		3.4		4.4		3.7	
(1) Gender								
Male	4.8	0.279	3.7	0.012*	4.7	0.012*	3.9	0.121
Female	4.2		2.2		3.2		2.9	
(2) Age group								
Young	5.2	0.273	3.2	0.153	4.7	0.594	3.7	0.013*
Middle	4.4		3.3		4.2		3.3	
Old	4.3		4.7		4.5		5.5	
(3) Exposure to suspected or probable SARS cases								
Exposed	4.6	0.559	3.5	0.947	4.2	0.174	3.7	0.926
Non-exposed	4.9		3.4		4.8		3.7	
(4) Working district								
High infection region	4.3	0.204	3.1	0.481	4.1	0.315	3.3	0.206
Low infection region	4.9		3.5		4.6		3.9	
(5) Professional experience								
Experienced	4.6	0.364	3.3	0.431	4.2	0.114	3.6	0.341
Inexperienced	5.1		3.7		5.1		4.1	
(6) Primary practice setting								
Solo practice	4.8	0.467	3.6	0.281	4.6	0.238	3.9	0.164
Group practice	4.5		3.0		4.0		3.3	
(7) Type of clinic								
Private	4.8	0.274	3.6	0.033*	4.5	0.172	3.9	0.077
Public	4.0		2.0		3.6		2.6	

*Significant at 0.05 level.

taken daily. In the SARS exposed doctors, they were more likely to ensure their staff wearing gloves and masks all the time (33.7% versus 11.5% and 100.0% versus 92.3% respectively; $p<0.01$) whereas the highly anxious doctors were more likely to ensure staff to wear gloves at work (32.4% versus 17.9%; $p<0.05$).

Paradoxically, doctors who had encountered SARS were less likely to quarantine themselves until confirmation (10.8% versus 33.3%; $p<0.01$). Doctors who worked in districts of high infection rate were also less likely to quarantine themselves (6.5% versus 27.5%; $p<0.01$) or grant leave to staff (41.3% versus 71.3%; $p<0.01$) until confirmation or for a 10 day period (37.0% versus 66.7%; $p<0.01$) but private doctors were more likely than their public sector colleagues to quarantine themselves for a 10 day period once contacted a SARS patient (58.1% versus 31.3%; $p<0.05$).

Protecting family

Most doctors tried to protect their family from the infection by taking a shower (80.7%) or washing hands (70.4%) before going home, or cleaning their home regularly with disinfectant (71.9%). Some even took extreme measures such as staying away from home (6.7%), wearing masks at home (4.4%), or sending the family away (3.0%). Public (18.8% versus 5.1%; $p<0.05$) doctors were more likely to stay away from home (table 4). Doctors who worked in highly infectious districts were more likely to wash their hands before going home (82.6% versus 63.0%; $p<0.05$) and use disinfectants to clean surface regularly (87.0% versus 65.4%; $p<0.01$) (table 4). Very anxious doctors were more likely to wash hands before entering their home (79.4% versus 61.2%; $p<0.05$).

DISCUSSION

This study found significant anxiety in primary care doctors when dealing with SARS and those who had worried about their family were found to have greater effects on their quality of life. Their clinical practices and behaviour have changed in response to this epidemic. Exposures to SARS, the infection rate in the working district and anxiety levels had significant impacts on the level of protection or prescribing behaviour.

Limitation and strength of the study

The study had a number of limitations. Firstly, the sample size of 137 doctors represented 3%–4% of the community doctors in Hong Kong, which meant the study only had power to detect large changes in clinical practices and behaviour. However, this suggests the significant changes that were observed were important. Secondly, the sample was not selected to be representative of all community doctors in Hong Kong but a group that was more interested in medical education and arguably more progressive as their teaching activities were counted toward continuous medical education, which was not mandatory in Hong Kong. Thirdly, as an observational study, the findings relied on self reporting.

The study's strengths are that it recognised the impact of SARS was a complex and multi-dimensional one and thus methods were designed to reflect this nature. For example, it included anxiety, clinical practices, and roles of family and staff. Secondly, this study benefits from an unusually high response rate. This may be attributable to the shocking, novel nature of SARS and, that this topic was very important and relevant to our community doctors.

Implications for clinical practice and health policies

This research confirms physicians' anxiety when faced with an outbreak of a largely unknown infection. Despite worries for the safety of self and their families, GPs in Hong Kong demonstrated willingness to discharge their duty and ability to adapt that was expected from a highly professional workforce. However, the clinical manifestation of SARS is not so dissimilar to the other causes of respiratory tract

Table 3 Clinical practices and behaviour of community doctors during SARS epidemic

Clinical practices	n (%)	Solo (%)	Group (%)	Private (%)	Public (%)	Exposed (%)	Non-exposed (%)	High (%)	Low (%)	High (%)	Low (%)
Wore mask during all consultations	130 (97.7)	100.0	93.2*	98.3	93.8	96.4	100.0	97.1	98.5	100.0	96.3
Wore goggles	37 (27.4)	27.8	25.0	25.6	37.5	28.9	25.0	27.9	26.9	32.6	23.5
Wore gowns	66 (48.9)	46.7	54.5	45.3	81.3**	55.4	38.5	52.9	44.8	63.0	42.0*
Washed hands after seeing, examining a patient	93 (70.5)	70.5	69.8	69.3	75.0	69.1	72.5	68.7	72.3	67.4	70.5
Insisted patient wearing mask	79 (58.5)	57.1	60.5	55.6	75.0	65.1	48.1*	68.1	48.5*	65.2	53.1
Routinely tested patient's temperature	92 (68.1)	68.1	69.8	70.1	56.3	71.1	63.5	71.0	65.2	71.7	66.7
Kept greater distance from patients	47 (34.8)	36.3	32.6	35.0	37.5	30.1	42.3	37.7	31.8	34.8	33.3
Saw patients at a faster pace	21 (15.6)	12.1	23.3	10.3	56.3**	18.1	11.5	20.3	10.6	21.7	11.1
Avoided physical examination	10 (7.4)	5.5	11.6	6.0	18.8	6.0	9.6	10.1	4.5	8.7	7.4
Requested more blood tests and/or chest radiograph	103 (76.3)	71.4	86.0	74.4	87.5	80.7	69.2	76.8	75.8	78.3	75.3
Over prescribed antibiotics	33 (24.4)	26.4	18.6	23.1	25.0	30.1	15.4*	23.2	25.8	28.3	19.8
Own appointments postponed/cancelled	42 (31.1)	27.5	39.5	29.1	50.0	34.9	25.0	31.9	30.3	37.0	28.4
Specialist appointments postponed/cancelled	22 (16.3)	11.0	27.9*	13.7	37.5*	16.9	15.4	15.9	16.7	19.6	13.6
Difficulties in making specialty referrals	17 (12.6)	13.2	9.3	10.3	25.0	10.8	15.4	10.1	15.2	17.4	8.6
Closed the clinic because of SARS	10 (7.4)	8.8	4.5	8.5	0.0	10.8	1.9*	8.7	6.0	15.2	3.7*
Reduced working hour because of SARS	7 (5.1)	6.6	2.3	5.9	0.0	6.0	3.8	4.3	6.0	4.3	6.1
Quarantined until confirmation of a suspected case	26 (19.4)	21.3	15.9	19.8	18.8	10.8	33.3**	22.4	16.4	6.5	27.5**
Quarantined for 10 days after a probable case	75 (55.6)	57.8	50.0	58.1	31.3*	50.6	63.5	55.9	55.2	37.0	66.7**

*Significant at 0.05 level; **significant at 0.01 level.

Table 4 Levels of protection among staff and family

Protection	n (%)	Type of practice		Type of clinic		Exposure to SARS		Anxiety level		Infection area	
		Solo (%)	Group (%)	Private (%)	Public (%)	Exposed (%)	Non-exposed (%)	High (%)	Low (%)	High (%)	Low (%)
Staff required to wear masks	130 (97.0)	95.6	100.0	96.6	100.0	100.0	92.3**	98.5	95.5	95.7	97.5
Cleaned work surface with antiseptics	125 (92.6)	92.2	93.2	93.2	93.8	91.6	94.2	89.7	95.5	87.0	96.3*
Staff had temperature taken	34 (25.2)	25.6	25.0	23.1	43.8	26.5	23.1	23.5	26.9	32.6	19.8
Staff wore disposable gloves	34 (25.2)	25.6	25.0	22.2	50.0*	33.7	11.5**	32.4	17.9*	30.4	19.8
Quarantined leave to staff	80 (59.7)	58.4	61.4	62.4	33.3*	56.6	64.7	58.2	61.2	41.3	71.3**
Doctor showered before going home	109 (80.7)	80.0	84.1	80.3	93.8	78.3	84.6	80.9	80.6	78.3	81.5
Doctors washed hands before entering home	95 (70.4)	71.1	70.5	70.9	75.0	71.1	69.2	79.4	61.2*	82.6	63.0*
Doctors used disinfectant to clean home	97 (71.9)	73.3	70.5	73.5	62.5	74.7	67.3	70.6	73.1	87.0	65.4**
Doctors stayed away from home	9 (6.7)	5.6	9.1	5.1	18.8*	7.2	5.8	8.8	4.5	4.3	7.4
Doctor wore a mask in home	6 (4.4)	4.4	4.5	4.3	6.3	6.0	1.9	4.4	4.5	8.7	2.5
Doctor sent family away	4 (3.0)	2.2	2.3	2.6	0.0	2.4	3.8	2.9	3.0	0.0	2.5

*Significant at 0.05 level; **significant at 0.01 level.

infections.[1 11 13] Thus, GPs with no immediate access to the investigation facilities and support from the HA hospitals, led to more requests for tests or over prescription of antibiotics, which were at least expensive or sometimes harmful for the patients. To reduce chances of infection, some doctors resorted to keeping a greater distance from their patients, spending less time with them, or avoiding physical examinations, which, in turn, might affect the standard of care, and might result in more patients seeking care at hospitals.

On the other hand, inadequate precautions, failure to apply isolation precautions to cases not yet identified as SARS, and breach of procedures were found to be three major reasons for the spread of infection to the health workers.[11] Some good clinical practices such as frequent hand washing in between patients or before going home, or regular cleaning of work surfaces with antiseptics were largely forgotten. Although they were encouraged during the epidemic, the overall rates were far from satisfactory (70.5%, 70.4%, and 92.6% respectively). There have been no specific guidelines published for the community doctors, even though their exposure was high and risks were real. If the guidelines for hospital health workers—that is, regular hand washing as well as wearing masks, goggles, head cover, gowns, and gloves when caring for SARS patients[12 14]—were applicable to the GPs, the precautions undertaken by them and their staff were grossly inadequate.

As this disease outbreak was so swift and the treatment so controversial,[5–7] hospitals in Hong Kong had been put under huge pressure for managing suspected or probable cases. In turn, this led to serious strains on the current health resources with disruptions in services other than for ''life threatening'' ones as seen in specialist appointment cancellations or difficulties in getting appointments. To make the situation worse, the primary care system in Hong Kong is poorly developed and works independently from the rest of healthcare system, the latter dominated by HA: 70% of primary medical care is provided by the private sector whereas 90% of the hospital care is carried out in public institutions.[8 9] There is little interface between primary and secondary care, let alone collaborations between the private and public sectors.[10] This arrangement led to many self referrals to hospitals for screening or admission, and the secondary effect of this was to increase the risk of hospital cross infection (including SARS). However, the doctors in the public sector have been shown to be more likely to have worries of infecting their families. Any extra burden in the public sector will inevitably put more stress on our frontline doctors.

Our data also showed that many family doctors were aware of self isolation after contacting proven cases of SARS but in reality this was not carried out. This suggests that other considerations such as loss of income and difficulties in getting replacement doctors could have some part to play. Furthermore, solo practice is the dominant delivery mode of primary care in Hong Kong, which makes appointment cancellations and income reduction more imperative in crisis time. Without the financial support from the government and a contingency plan organised centrally, the community doctors could be exposed to unreasonable risks and act as a reservoir of infection.

In conclusion, this unexpected infection outbreak has created serious anxiety because of its novelty and rapid transmission in the hospital and the community. The social and psychological effects of this infection will continue to affect the lives of many patients and their families, a large number of them are medical professionals. This epidemic has exposed many weaknesses in the health system of Hong Kong and will invariably transform our future clinical practices and health policies.

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THE *JECH* GALLERY

Influential women in occupational health
Eula Bingham, PhD—Bridging Academia and Government

July 1929–, Country of birth: USA

A world class environmental scientist, Eula Bingham is a major contributor to public health through science based advocacy and regulatory toxicology. During her tenure as head of the US Occupational Safety and Health Administration (OSHA), Bingham recognised that standards were not sufficient to protect workers. She empowered workers with new rules that opened access to information from employers, previously available only to the agency. Despite several lawsuits designed to undo her policies, Bingham was courageous in her stance regarding access to information.

> ''People in government do not want to pay for committees. I think they are worth their weight in gold. By having different perspectives presented, important questions get considered early in the process.''

Bingham noted the importance of worker training, whistleblower protections, extension of coverage to public employees, and stronger enforcement authority. Under Bingham, OSHA adopted more standards (including acrylonitrile, benzene, cotton dust, inorganic arsenic, and lead) than in any similar time before or since. Currently, as Professor of Environmental Health, she is exploring the ethical and legal implications of genetic screening and monitoring at work.

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