Occupational Medicine
doi:10.1093/occmed/kqaa088

Physician deaths from corona virus (COVID-19) disease

E. B. Ing[1], Q. (A.) Xu[2], A. Salimi[3] and N. Torun[4]

[1]Ophthalmology, University of Toronto, 650 Sammon Avenue, K306, Toronto, ON M4C 5M5, Canada, [2]Medical Student, University of British Columbia, Vancouver, BC V6T 1Z3, Canada, [3]Medical Student, McGill University, Montreal, QC H3G 1Y6, Canada, [4]Ophthalmology, Harvard Beth Israel Deaconess, Boston, MA 02215, USA.

Correspondence to: E. B. Ing, Ophthalmology, University of Toronto, 650 Sammon Avenue, K306, Toronto, ON M4C 5M5, Canada. Tel: +1 416 465 7900; fax: +1 416 385 3880; e-mail: edinglidstrab@gmail.com

Abstract

Background The COVID-19 pandemic has caused much morbidity and mortality to patients but also health care providers.

Aims We tabulated the cases of physician deaths from COVID-19 associated with front-line work in hopes of mitigating future events.

Methods On 15 April 2020, a Google internet search was performed using the keywords 'doctor', 'physician', 'death', 'COVID' and 'coronavirus' in English and Farsi, and Chinese using the Baidu search engine. The age, sex and medical speciality of physicians who died from COVID-19 in the line of duty were recorded. Individuals greater than 90 years of age were excluded.

Results We found 278 physicians who died with COVID-19 infection, but complete details were missing for 108 individuals. The average age of the physicians was 63.7 years with a median age of 66 years, and 90% were male (235/261). General practitioners and emergency room doctors (108/254), respirologists (5/254), internal medicine specialists (13/254) and anaesthesiologists (6/254) comprised 52% of those dying. Two per cent of the deceased were epidemiologists (5/254), 2% were infectious disease specialists (4/254), 6% were dentists (16/254), 4% were ENT (9/254) and 3% were ophthalmologists (8/254). The countries with the most reported physician deaths were Italy (121/278; 44%), Iran (43/278; 15%), Philippines (21/278; 8%), Indonesia (17/278; 6%), China (16/278; 6%), Spain (12/278; 4%), USA (12/278; 4%) and UK (11/278;4%).

Conclusions Physicians from all specialities may die from COVID. Lack of personal protective equipment was cited as a common cause of death. Consideration should be made to exclude older physicians from front-line work.

Key words COVID-19; death; mortality; novel coronavirus; physician.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has infected over 3 million individuals worldwide with an overall 6.9% risk of death as of 27 April 2020 [1]. Physicians caring for COVID-19-infected patients are at high risk of contagion and possible mortality. To quantify and mitigate this risk, the underlying characteristics of physician deaths from COVID infection were investigated.

Methods

No research ethics board approval was required for this publicly available information. On 15 April 2020, a Google internet search was performed using the keywords 'doctor', 'medic', 'physician', 'die', 'death', 'COVID', 'COVID-19' and 'corona' in English, and repeated in Farsi. An additional search was performed on Baidu (the Chinese version of Google) using the equivalent Chinese characters. An additional PubMed search was performed using the English search terms.

Key learning points

What is already known about this subject:
- COVID-19 is associated with an overall worldwide mortality of ~7%.

What this study adds:
- Physicians from almost all specialties have died from COVID-19.
- The majority of physicians that died from COVID-19 were of older age.

What impact this may have on practice or policy:
- All physicians require personal protective equipment, appropriate for their specialty.
- If possible, older physicians should avoid front-line work with COVID-19 patients.

Physicians and dentists who died after contracting COVID-19 from patient care activities or interactions with medical colleagues were included. Where available, the doctor's age, practice focus, gender, country and the date of the report were recorded. Retired doctors, practitioners over 90 years of age, and physicians who died from 'exhaustion' or myocardial infarction while caring for COVID-19 patients were also noted, but not included in the final database. Data were analysed using Stata 15.1 (StataCorp LLC, College Station, TX, USA).

Results

On a PubMed search on 15 April 2020, no articles on physician deaths and COVID-19 were found. However, one letter discussed the death of 23 Chinese health care workers from COVID-19, two of whom were physicians [2]. Our internet search focused on physician deaths related to COVID-19 infection due to front-line work or interactions with work colleagues. The date of the reports ranged from 7 February 2020 to 15 April 2020. Complete age details were only available on 173 physicians. The Italian National Federation of Medicine Surgery and Odontology [3] had a complete list of physician deaths in the country from COVID-19. The deaths in other countries required compilation from numerous web articles.

Four physicians who were patient-facing but not proven to have COVID infection were not included in the final database; the apparent reasons for death included 'cardiac compromise' or 'exhaustion' [4–7]. Doctors that died from COVID infection not attributed to front-line work or interaction with work colleagues were also excluded [8,9].

Physicians older than 90 years of age were excluded from this study. The age details were missing for 49 individuals. The average age of the physicians that died was 63.5 years (range 28–90 years) and the median age was 66.0 years. Physicians 59 years of age or older accounted for three-quarters of COVID-related deaths.

Ninety per cent (175/194) of the deceased physicians were male. General practitioners and emergency room doctors (78/254), respirologists (5/254), internal medicine specialists (11/254) and anaesthesiologists (6/254) comprised 52% of those dying. Two per cent of the deceased were epidemiologists (4/254), 2% were infectious disease specialists (4/254), 4% were ENT (8/254), 4% were ophthalmologists (7/254) and 5% were dentists (9/254) (see Table 1).

Table 1. Reported physician deaths from COVID-19 by practice specialty and median age (n = 254) on 15 April 2020

Specialty	Frequency, n (%)	Median age (years)
General practitioner/ emergency room	107 (42)	67
Medicine	13 (5)	69
Respirology	5 (2)	74
Anaesthesiology	6 (2)	68
Epidemiology	5 (2)	66
Infectious disease	4 (2)	64
Forensics	3 (1)	65
Microbiology	1 (0.5)	.
Psychiatry	6 (2)	64
Paediatrics	3 (1)	64
Cardiology	8 (3)	68
Haematology	3 (1)	63
Oncology	4 (2)	46
Neurology	2 (1)	34
Hepatology	1 (0.5)	69
Gastroenterology	1 (0.5)	29
Transplant medicine	2 (2)	60
Radiology	3 (1)	52
Physiatrist	1 (0.5)	68
Occupational health	3 (1)	62
Otorhinolaryngology	9 (4)	61
Ophthalmology	8 (3)	57
Dentistry	16 (6)	70
General surgery	11 (4)	63
Obstetrics and gynaecology	7 (3)	59
Neurosurgery	3 (1)	70
Cardiac surgery	2 (2)	62
Orthopaedics	1 (0.5)	54
Urology	3 (1)	66
Plastic surgery	1 (0.5)	62

Twenty-three per cent (58/192) of the physicians practised a surgical speciality with average age 62.9 years, compared to their primary care or medicine colleagues of average age 64.0 years. There was no statistically significant difference between the ages of the surgeons and non-surgeons (*t*-test, $P = 0.61$).

The countries with the most reported physician deaths were Italy (121/278; 44%), Iran (43/278; 15%), Philippines (21/278; 8%), Indonesia (17/278; 6%), China (16/278; 6%), Spain (12/278; 4%), USA (12/278; 4%) and UK (11/278; 4%) (see Table 2).

Discussion

Death in the line of duty is the doctor's ultimate sacrifice, which may be compounded when physicians unknowingly infect family members [10]. The general public may not comprehend the importance of self-isolation measures to contain the COVID-19 pandemic until a physician dies fighting the virus [11].

We acknowledge the limitations of this paper. The number of physician deaths from COVID-19 is likely under-reported given our criteria for proven infection, the rapidly changing course of the pandemic, and because national mortality figures may not be available or accurately reported if all patients are not tested. Although reliance on social media searches is suboptimal, it may be the only accessible source of information, especially in countries with limited press freedom. We could not discern if the physicians died from COVID-19 or underlying conditions with an associated viral infection. Pre-existing medical morbidities were not uniformly reported. We did not examine the number of physicians infected with COVID who have not died; nor did we enumerate the mortality of our nursing and allied health colleagues.

Table 2. Reported physician deaths from COVID-19 by country ($n = 278$) on 15 April 2020

Country	Frequency, *n* (%)	Median age (years)
Italy	121 (43)	69
Iran	43 (15)	54
Philippines	21 (8)	62
Indonesia	17 (6)	58
China	16 (6)	51
Spain	12 (4)	61
USA	12 (4)	65
UK	11 (4)	68
France	7 (3)	66
Pakistan	3 (1)	46
Brazil	2 (1)	53
Egypt	2 (1)	50
Mexico	2 (1)	45
Turkey	2 (1)	67
Canada	1 (1)	62
Germany	1 (1)	58
Greece	1 (0.5)	–
Honduras	1 (0.5)	56
Poland	1 (0.5)	–
Serbia	1 (0.5)	59
South Korea	1 (0.5)	60

Physician deaths from COVID-19 may vary between countries due to the time of disease outbreak, differential public health resources, governmental policies and controls to enforce quarantine and social distancing, face mask wear, the amount of testing performed, ascertainment bias, available medical supplies and technology and social greeting habits [12]. Nations such as Singapore, South Korea and Taiwan that exercised decisive action to prevent travel from affected regions, strict enforcement of quarantines and widespread testing contained the epidemic had few reported physician deaths [13]. South Korea had no physician or nurse deaths from COVID-19 until 10 weeks after their disease outbreak [14,15]. As the disease onset in North America and the UK lagged behind Asia and Europe, the coming weeks may reveal a rise in COVID-19-related physician deaths in these regions. On 15 April 2020, there were at least 15 COVID-19-related physician deaths in North America. An increasing number of North American physicians have contracted COVID-19 and are in critical care [16].

Physicians from almost all the medical specialities from psychiatry to urology have succumbed to work-related COVID-19. Practitioners working in the airway such as dentists, otorhinolaryngologists and anaesthesiologists are especially at risk for COVID-19 infection and this group comprised 12% of all physician deaths. Dentists are in close proximity to oral secretions for prolonged periods and their high-speed handpiece and ultrasonic instruments aerosolize body fluids. In our review 6% of the fatalities were dentists. Surprisingly, a recent paper from China [17] no dentists were reported to die from COVID-19 contracted during patient encounters. Ophthalmologists also work for extended periods close to oronasal secretions. Dr Li Wenliang, the ophthalmologist from China who first alerted the world to COVID-19, died from the disease at the age of 33 years. Subsequently, two more ophthalmologists at Li's workplace passed from COVID-19, perhaps due to prolonged proximity to the airway of infected patients during ophthalmoscopy, tear transmission of the virus or from nasolacrimal manipulations.

Lack of personal protective equipment (PPE) and inadequate PPE were commonly cited as a cause of death especially in developing nations and Italy [18]. When PPE is available, proper donning and doffing techniques are required. If adequate manpower is available work teams with a primary examiner, safety monitor and scribe may decrease the risk of inadvertent contamination.

Patients who lied about their travel history of infectious contacts have also been attributed to physician deaths from COVID-19 [13]. Mandatory passport inspections during pandemics might avert the former. Meticulous public health investigations and expeditious location of all contacts assisted by smartphone tracking might prevent the latter.

Health care workers endure considerable mental and physical stress caring for patients with COVID-19. A French physician committed suicide after discovering he was infected [19]. An American emergency room doctor took her own life after recovering from COVID-19 [20]. At least three physicians, supposedly without viral infection, died from exhaustion or cardiac compromise [4,5], and one was 28 years old [6]. During pandemics, hospitals should organize physician shifts with mandatory rest and meal breaks. Medical societies can bolster online supports to keep doctors connected with their colleagues for information and social support. The government can help physicians care for their families, provide lodging closer to the hospital and legislate life insurance enhancements.

Purported risk factors for severe disease and death in COVID-19 include older age, male gender, hypertension, diabetes mellitus, cardiovascular disease, chronic lung disease and immunocompromise [21]. Senior physicians and those with co-morbidities ideally should not be assigned to front-line work with COVID-19 patients, but instead duties such as video or phone assessments, consulting or public liaison [22].

Italian physicians have suggested that a community-centred or home care system for COVID-19 rather than a hospital-focused system might decrease the transmission of disease and physician exposure [23].

Patient monitoring technologies that track pulse oximetry and vital signs and medical robots allow doctors and nurses to remotely assess and treat infected patients, can enhance patient care and decrease risks to health care workers. At present robots that take temperatures, deliver food and supplies, and disinfect rooms have been described [24]. However, in countries without resources for even gloves or masks, robots are wishful thinking.

In summary, physicians from almost all medical specialities have succumbed to COVID-19, and all require task-appropriate personal protective PPE. We are in the initial phase of the pandemic and the number of physician fatalities will increase. Doctors who were 59 years of age or older accounted for three-quarters of COVID-19-related deaths. If senior or retired physicians are recalled to work during the COVID-19 crisis [25], consideration should be made to place them away from the front line due to the higher risk of mortality, and the increased likelihood of burden to the medical system if they become infected.

Funding

None declared.

Acknowledgements

We honour the efforts and sacrifice of all physicians, nurses and allied health workers fighting the COVID-19 pandemic that were not mentioned in this manuscript.

Competing interests

None declared.

References

1. Johns Hopkins University & Medicine. Coronavirus COVID-19 Global Cases by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU) [Online]. 2020 [cited 24 March 2020]. https://coronavirus.jhu.edu/map.html (24 March 2020, date last accessed).
2. Zhan M, Qin Y, Xue X, Zhu S. Death from Covid-19 of 23 health care workers in China. *N Engl J Med* 2020. doi:10.1056/NEJMc2005696.
3. Fedarazione Nazionale degli Ordini del Medici Chirughi e degli Odontoiatri. Elenco dei Medici caduti nel corso dell'epidemia di Covid-19 [Online]. 2020 [cited 27 March 2020]. https://portale.fnomceo.it/elenco-dei-medici-caduti-nel-corso-dellepidemia-di-covid-19/ (27 March 2020, date last accessed).
4. Wang H. Anti-epidemic Doctors in Hubei Received More Than 3,000 Consultations in One Month. Sudden Death at Home Was Not Identified as a Work-Related Injury [Online]. 2020. https://www.guancha.cn/politics/2020_02_26_538527.shtml (24 March 2020, date last accessed).
5. Koresponden N. Tempco.Co Hero's Award Honored for Medics Who Passed Away to COVID-19 [Online]. 2020. https://en.tempo.co/read/1322938/heros-award-honored-for-medics-who-passed-away-to-covid-19 (24 March 2020, date last accessed).
6. Ng K. The Independent. Coronavirus Doctor Dies of Heart Attack After Working 10 Days Straight [Online]. 2020. https://www.independent.co.uk/news/world/asia/coronavirus-doctor-dies-china-song-yingjie-hunan-heart-attack-a9321946.html (11 April 2020, date last accessed).
7. Time. A New York Doctor Who Died After Fever and Cough Was Never Tested for Coronavirus, Highlighting the Limits of the Official Toll [Online]. 2020. https://time.com/5818062/new-york-doctor-coronavirus-death-toll/ (8 April 2020, date last accessed).
8. Channel News Asia (CNA). Malaysian Doctor Who Had COVID-19 Dies [Online]. 2020. https://www.channelnewsasia.com/news/asia/covid-19-death-malaysian-doctor-travel-12564804 (24 March 2020, date last accessed).
9. CBCNews. First Quebec Doctor Dies of COVID-19 [Online]. 2020. https://www.msn.com/en-ca/news/canada/first-quebec-doctor-dies-of-covid-19/ar-BB12JHnu (15 April 2020, date last accessed).
10. Weise K. New York Times. Doctors Fear Bringing Coronavirus Home: 'I Am Sort of a Pariah in My Family' [Online]. 2020. https://www.nytimes.com/2020/03/16/us/coronavirus-doctors-nurses.html (24 March 2020, date last accessed).

11. Channel News Asia. France Toughens Lockdown Penalties as Coronavirus Kills Doctor [Online]. 2020. https://www.channelnewsasia.com/news/world/coronavirus-france-doctor-death-economy-workers-covid-19-12565294 (24 March 2020, date last accessed).
12. Blackwell T. Financial Post. Why the COVID-19 Death Rate Varies Dramatically from Country to Country [Online]. 2020. https://nationalpost.com/news/why-the-covid-19-death-rate-varies-dramatically-from-country-to-country (24 March 2020, date last accessed).
13. Xinghui K. This Week in Asia. Why Are There So Few Coronavirus Infections in Singapore's Health Workers? [Online]. 2020. https://www.scmp.com/week-asia/health-environment/article/3077345/coronavirus-why-so-few-infections-singapores-health (28 March 2020, date last accessed).
14. Yoon D. The Wall Street Journal. How South Korea Solved Its Acute Hospital-Bed Shortage [Online]. 2020. https://www.wsj.com/articles/how-south-korea-solved-its-acute-hospital-bed-shortage-11584874801 (24 March 2020, date last accessed).
15. Yonhap News Agency. Doctor Infected With COVID-19 Dies in S. Korea [Online]. 2020. https://en.yna.co.kr/view/AEN20200402007400320 (3 April 2020, date last accessed).
16. Kirsch T. The Atlantic. CORONAVIRUS: COVID-19 What Happens If Health-Care Workers Stop Showing Up? [Online]. 2020. https://www.theatlantic.com/ideas/archive/2020/03/were-failing-doctors/608662/ (24 March 2020, date last accessed).
17. Meng L, Hua F, Bian Z. Coronavirus disease 2019 (COVID-19): emerging and future challenges for dental and oral medicine. *J Dental Res*. 2020. doi:10.1177/0022034520914246.
18. Salvatori G. Euronews. Italian Doctor Dies of Coronavirus After Working Without Gloves Due to Shortage [Online]. 2020. https://www.euronews.com/2020/03/18/italian-doctor-dies-of-coronavirus-after-working-without-gloves-due-to-shortage (24 March 2020, date last accessed).
19. AFP. StraitsTimes [Online]. 2020. https://www.nst.com.my/world/world/2020/04/581620/french-doctor-commits-suicide-after-covid-19-diagnosis (6 April 2020, date last accessed).
20. NBC New York. NYC Emergency Room Doctor Dies by Suicide After Treating COVID-19 Patients [Online]. 2020. https://www.nbcnewyork.com/news/coronavirus/nyc-emergency-room-doctor-dies-from-suicide-after-treating-covid-19-patients/2391978/ (28 April 2020, date last accessed).
21. Jordan RE, Adab P, Cheng KK. Covid-19: risk factors for severe disease and death. *Br Med J* 2020;**368**:m1198.
22. Buerhaus PI, Auerbach DI, Staiger DO. Older clinicians and the surge in novel Coronavirus disease 2019 (COVID-19). *J Am Med Assoc*. 2020. doi:10.1001/jama.2020.4978.
23. Nacoti M, Ciocca A, Giupponi A *et al*. NEJM Catalyst. At the Epicenter of the Covid-19 Pandemic and Humanitarian Crises in Italy: Changing Perspectives on Preparation and Mitigation [Online]. 2020. https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0080 (24 March 2020, date last accessed).
24. Yang GZ, Nelson BJ, Murphy RR, Choset H, Christensen H, Collin SH. Robots and Society. Combating Covid-19—The Role of Robotics in Managing Public Health and Infectious Disease [Online]. 2020. https://robotics.sciencemag.org/content/5/40/eabb5589 (25 March 2020, date last accessed).
25. Hume T. Vice.com. Italian Doctors Are Coming Out of Retirement to Treat Coronavirus—And Dying [Online]. 2020. https://www.vice.com/en_ca/article/v74jwm/italian-doctors-are-coming-out-of-retirement-to-treat-coronavirus-and-dying (24 March 2020, date last accessed).