

# Health-Seeking Behaviour Among COVID-19 Cases In Singapore: Does Single or Multiple Physicians Make A Difference?

**Min Zhi Tay**

Tan Tock Seng Hospital <https://orcid.org/0000-0002-0812-6885>

**Li Wei Ang**

National Centre for Infectious Diseases

**Wycliffe Enli Wei**

National Centre for Infectious Diseases

**Vernon JM Lee**

Ministry of Health

**Yee-Sin Leo**

NCID: National Centre for Infectious Diseases

**Matthias Paul HS Toh** (✉ [Matthias\\_HS\\_TOH@ncid.sg](mailto:Matthias_HS_TOH@ncid.sg))

NCID: National Centre for Infectious Diseases <https://orcid.org/0000-0001-5830-0071>

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## Research article

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# Abstract

**Background:** COVID-19 is a novel pandemic affecting almost all countries leading to lockdowns worldwide. In Singapore, locally-acquired cases emerged after the first wave of imported cases, and these two groups may have different health-seeking behaviour affecting disease transmission.

**Objective:** We investigated differences in health-seeking behaviour between locally-acquired cases and imported cases, and within the locally-acquired cases, those who saw single versus multiple healthcare providers.

**Methods:** We conducted a retrospective study of 258 patients who were diagnosed with COVID-19 from 23 January to 17 March 2020. Variables related to health-seeking behaviour included number of visits prior to hospitalisation, timing of the first visit, duration from symptom onset to admission, and places where the cases had at least one visit.

**Results:** Locally-acquired cases had longer duration from symptoms onset to hospital admission (median 6 days, range 1-30) than imported cases (median 4 days, range 1-13) ( $p < 0.0005$ ). Singapore residents were more likely to have at least one visit to private clinics and/or government-subsidised public clinics than non-residents (84.0% vs. 58.7%,  $p < 0.0005$ ). Among locally-acquired cases, those who sought care from a single provider had fewer visits before their hospital admissions compared with those who went to multiple care providers (median 2 vs. 3,  $p = 0.001$ ).

**Conclusion:** Our study indicates the need to encourage individuals to seek medical attention early on in their patient journey, particularly from their family physician or the same doctor. This in turn, would facilitate early detection and isolation, hence limiting local transmission and enabling better control of the pandemic.

## Introduction

As of 11 June 2020, the COVID-19 pandemic virus has affected 214 countries with over 7.4 million confirmed cases, leaving health and economic disruptions of unimagined magnitude in its wake [1]. In Singapore, 38,965 confirmed cases with 25 deaths were recorded on 11 June 2020 [2] since detection of the first case on 23 January 2020. In response, the country swiftly adopted community-based public health measures in order to “flatten the epidemic curve” and avoid overwhelming the healthcare system [3].

Healthcare effectiveness is the crux of any emergency preparedness response, with providers building up surge capacity during normal operations in preparation in the event of high impact occurrence which could escalate care demand and strain existing resources to their breaking point, [4, 5]. Hence, health-seeking behaviour of the entire population is a critical factor to take into consideration in emergency preparedness models so as to ensure maximal effectiveness and optimal care capacity at all levels.

Previous studies in Singapore conducted after the severe acute respiratory syndrome (SARS) outbreak highlighted importance of primary health providers as patient care resource and first contact points, emphasising potential surveillance and care augmentation capacities in outbreak situations. This in turn, would prompt early detection, facilitating subsequent isolation and treatment to reduce transmission [6, 7]. Other international studies also featured primary health providers in additional roles including sentinel surveillance [5, 8–12].

In Singapore, independent primary care private clinics are voluntarily engaged under the Public Health Preparedness Clinics (PHPC) scheme [13]. These clinics, deployed in times of public health crisis to provide affordable community care and earlier detection of suspected cases, were activated in February 2020 in response to the COVID-19 situation [14].

This study aims to describe characteristics of COVID positive cases and their health-seeking behaviour prior to hospital admission and isolation; and to investigate potential differences in locally-acquired cases who sought care from single or multiple primary care providers.

## Methods

Data on all cases diagnosed with COVID-19 by SARS-CoV-2 real-time polymerase chain reaction (RT-PCR) from 23 January to 17 March 2020 were collected as part of routine epidemiological investigations under the Infectious Diseases Act.

Primary care was defined as community ambulatory health services, consisting of private clinics and government-subsidised public clinics, in addition to emergency department (ED) of hospitals where patients were not admitted. Locally-acquired cases were patients who did not report travelling outside Singapore up to 14 days before symptoms onset. Imported cases were travellers who returned to Singapore within 14 days of symptoms onset.

Exclusions include asymptomatic patients as they would not have visited primary healthcare institutions, and persons subsequently determined to be false positives.

We investigated health-seeking behaviour in terms of primary healthcare visits prior to hospitalisation, timing of first visit, duration from symptom onset to admission, and medical touchpoints where cases reported at least one visit. Numbers and proportions were presented for categorical variables, and median and interquartile range (IQR) for continuous variables. Fisher's exact test or Chi-square test was used to compare categorical variables, and Mann-Whitney U test to compare continuous variables between any two groups. All statistical tests were two-sided, and statistical significance was taken as  $p < 0.05$ . Statistical analyses were performed using IBM SPSS Statistics for Windows, V.24.0 and R version 3.6.2 (R Foundation for Statistical Computing, Vienna, Austria).

## Results

# Comparison of locally-acquired and imported cases

A total 265 cases were diagnosed with COVID-19 infection during the study period, of which 5 were asymptomatic cases and 2 were later determined false positives. The remaining 258 cases were included in the study, and their median age was 45 years.

Locally-acquired cases were older (median 50 years, range 5–86) than imported cases (median 40 years, range 19–83) (Table 1). Males constituted a higher proportion of imported cases than locally-acquired cases (64.9% vs 51.6%,  $p = 0.039$ ). A higher percentage of locally-acquired cases were Singapore residents compared with imported cases (85.7% vs 43.3%,  $p < 0.0005$ ). Majority (82.6%) of cases had at least 1 visit prior to hospitalisation. Among 213 cases with at least 1 visit, 60.1% first sought medical attention at primary care clinics or hospital ED prior to admission within 2 days of symptoms onset with no statistical difference detected between the locally-acquired and imported groups (62.5% vs 56.5%,  $p = 0.395$ ). Majority (89.8%) of locally-acquired cases attended primary care clinics at least once in their patient journey compared with 56.5% of the imported cases ( $p < 0.0005$ ).

Singapore residents were more likely to have at least 1 visit to private clinics and/or government-subsidised public clinics than non-residents (84.0% vs. 58.7%,  $p < 0.0005$ ). About 10.2% of locally-acquired cases attended ED without having any clinic visits, compared with 43.5% of imported cases ( $p < 0.0005$ ).

Table 1  
 Characteristics of locally-acquired and imported COVID-19 cases in Singapore, 23 January to 17 March 2020

Characteristics	All cases	Locally-acquired	Imported	P-value
	(N = 258)	(N = 161)	(N = 97)	
Age in years, median (range)	45 (5–86)	50 (5–86)	40 (19–83)	0.005
Male, n (%)	146 (56.6)	83 (51.6)	63 (64.9)	0.039
Singapore resident, n (%)	180 (69.8)	138 (85.7)	42 (43.3)	< 0.0005
Number of visits before admission, median (range)	1 (0–6)	1 (0–6)	1 (0–4)	0.009
Number of visits before admission, n (%)				< 0.0005
0	45 (17.4)	33 (20.5)	12 (12.4)	
1	122 (47.3)	55 (34.2)	67 (69.1)	
2	50 (19.4)	38 (23.6)	12 (12.4)	
3	30 (11.6)	25 (15.5)	5 (5.2)	
≥ 4	11 (4.3)	10 (6.2)	1 (1.0)	
Days from symptom onset to admission, median (range)	5 (1–30)	6 (1–30)	4 (1–13)	< 0.0005
<b>Cases with at least 1 visit</b>	<b>All cases</b>	<b>Locally-acquired</b>	<b>Imported</b>	<b>P-value</b>
	<b>(n = 213)</b>	<b>(n = 128)</b>	<b>(n = 85)</b>	
At least 1 visit, n (%)				
Primary care (GP or polyclinic)	163 (76.5)	115 (89.8)	48 (56.5)	< 0.0005
ED	87 (40.8)	34 (26.6)	53 (62.4)	< 0.0005
Timing of first visit (for those with at least 1 visit), median (range)	2 (1–14)	2 (1–14)	2 (1–13)	0.466

Characteristics	All cases	Locally-acquired	Imported	P value
	(N = 258)	(N = 161)	(N = 97)	
Timing of first visit (for those with at least 1 visit), n (%)				0.907
Day 1	61 (28.6)	37 (28.9)	24 (28.2)	
Day 2	67 (31.5)	43 (33.6)	24 (28.2)	
Day 3	30 (14.1)	17 (13.3)	13 (15.3)	
Day 4	21 (9.9)	13 (10.2)	8 (9.4)	
Day 5	14 (6.6)	8 (6.3)	6 (7.1)	
Day 6 or later	20 (9.4)	10 (7.8)	10 (11.8)	

Approximately 21.7% of locally-acquired cases had 3 or more primary care / ED visits compared with 6.2% of imported cases ( $p = 0.0007$ ). Locally-acquired cases had longer duration from symptoms onset to hospital admission (median 6 days, range 1–30) than imported cases (median 4 days, range 1–13) ( $p < 0.0005$ ). The duration decreased as the epidemic progressed (Fig. 1).

The number of primary care visits and duration from symptom onset to hospital admission exhibit a more widespread distribution among locally-acquired cases (Fig. 2). There was a positive correlation between the number of visits prior to hospitalisation and duration from symptom onset to hospital admission (Spearman's  $\rho = 0.461$ ,  $p < 0.0005$ ).

## Comparison of locally-acquired cases who sought care from a single or multiple care providers

Among locally-acquired cases with 2 or more visits, there was no significant difference between those who sought care from single and multiple care providers in their demographics: age (median 53 vs 48 years,  $p = 0.446$ ), gender (62.1% vs 65.9% were males,  $p = 0.805$ ) and nationality (86.2% vs 93.2% Singapore residents,  $p = 0.425$ ) (Table 2). There was also no difference in timing of first visit, duration from symptom onset to admission and length of hospital stay. Cases who sought care from the same provider had fewer visits compared with those with different care providers (median 2 vs. 3,  $p = 0.001$ ). A higher proportion of cases who saw multiple providers (61.4%) had at least 3 visits compared with those who saw a single provider (27.6%) ( $p = 0.008$ ). In addition, 72.4% of the latter group had 2 visits prior to their hospital admission (Fig. 3). In contrast, those with multiple care providers had up to 6 visits.

Table 2

Characteristics of locally-acquired COVID-19 cases with 2 or more visits before admission who saw primary care providers

Characteristics	All	Single care provider	Multiple care providers	P-value
	(N = 73)	(N = 29)	(N = 44)	
Age in years, median (range)	51 (23–86)	48 (23–75)	53 (24–86)	0.446
Male, n (%)	47 (64.4)	18 (62.1)	29 (65.9)	0.805
Singapore resident, n (%)	66 (90.4)	25 (86.2)	41 (93.2)	0.425
Number of visits before admission, median (range)	2 (2–6)	2 (2–3)	3 (2–6)	0.001
Number of visits before admission (Primary Care / Hosp ED), n (%)				0.026
2	38 (52.1)	21 (72.4)	17 (38.6)	
3	25 (34.2)	8 (27.6)	17 (38.6)	
4	4 (5.5)	0 (0.0)	4 (9.1)	
5	5 (6.8)	0 (0.0)	5 (11.4)	
6	1 (1.4)	0 (0.0)	1 (2.3)	
Timing of first visit, median (range)	2 (1–7)	2 (1–5)	2 (1–7)	0.403
Timing of first visit, n (%)				0.937
Day 1	22 (30.1)	10 (34.5)	12 (27.3)	
Day 2	27 (37.0)	11 (37.9)	16 (36.4)	
Day 3	12 (16.4)	4 (13.8)	8 (18.2)	
Day 4	6 (8.2)	2 (6.9)	4 (9.1)	
Day 5	5 (6.8)	2 (6.9)	3 (6.8)	
Day 6 or later	1 (1.4)	0 (0.0)	1 (2.3)	

Characteristics	All	Single care provider	Multiple care providers	P-value
	(N = 73)	(N = 29)	(N = 44)	
Days from symptom onset to admission, median (range)	8 (3–22)	8 (3–22)	8 (3–20)	0.586
Discharged from hospital, n (%)	71 (97.3)	27 (93.1)	44 (100.0)	0.154
LOS (days) of discharged patients, median (range)	15 (4–69)	15 (4–30)	15 (6–69)	0.731
Ever admitted to ICU, n (%)	17 (23.3)	6 (20.7)	11 (25.0)	0.781

## Discussion

Our study revealed differences in health-seeking behaviour in subgroups of COVID-19 cases in Singapore. Locally-acquired cases had significantly longer duration from symptoms onset to hospital admission than imported cases (median 6 days vs. 4 days). Among those with at least 1 visit prior to admission, a higher percentage of locally-acquired cases had sought medical attention at the primary care level than imported cases (89.8% vs. 56.5%).

Majority of imported cases were international Singaporean undergraduates (around 20–25 years) and foreigners working in Singapore. With widespread transmission of COVID-19, many cities and countries had introduced varying degrees of “lockdowns” as preventive measures, prompting their return. Some were infected with SARS-CoV-2 and presented for medical attention only after their arrival.

Interestingly, imported cases were more likely to attend ED, bypassing primary care clinics completely (43.5% of imported cases vs 10.2% of locally-acquired cases attended ED directly without any clinic visits,  $p < 0.0005$ ). Those who did attend clinics had fewer visits before being referred for further testing at the national screening centre or other EDs; 6.2% of imported cases had at least 3 primary care visits prior to admission compared with 21.3% of locally-acquired cases (Table 1). As the pandemic unfolded, Singapore MOH issued travel advisories and sent circulars to doctors on revisions of suspect case definitions, which partly accounted for fewer visits experienced by imported cases, with primary care doctors exercising more vigilance in their assessments for testing and isolation. In contrast, perception of lower community transmission risk resulted in locally-acquired cases being referred only after lack of clinical improvement despite repeated visits.

Although the attending doctor’s risk awareness is crucial in determining subsequent management, the patient’s own cognizance is equally vital. Locally-acquired cases might have attributed their symptoms to a common cold or gastroenteritis, resulting in delays lasting up to 1 month in seeking medical attention.

While seemingly innocuous under normal circumstances, this could have devastating consequences in an outbreak situation.

Our results also showed Singapore residents were more likely to attend primary care clinics than non-residents (84.0% vs 58.7%). Fever, cough, sore throat and diarrhoea were common presenting symptoms of COVID-19 cases [15], routinely managed within the community by family doctors. Hence, a higher proportion of non-residents lacking a family GP would directly attend the national screening centre or other hospital EDs.

Among locally-acquired cases with at least 2 visits to the same provider (median of 2 visits), 27.6% had 3 or more visits before being referred and admitted, compared with 61.7% of those who saw different providers (median of 3 visits). This highlights the risk of seeking care from multiple providers or 'doctor shopping' within the same illness episode [16–18]. Having no comparison basis from previous visits, a different doctor lacks pertinent information when formulating their management plan, typically leading to later diagnosis, isolation and treatment, consequently enabling transmission risks. Doctor shopping could be attributed to various reasons. First, healthcare accessibility: with high concentrations of primary care clinics island-wide, convenience of attending clinics near one's workplace and home outweighs care continuity concerns. Second, unmet expectations; patients might have misconceptions of partaking less efficacious medications as symptoms persist, or feel unsatisfied with previous consultations. Hence, appropriate population messaging including seeking care from the same family physician in the first instance, is crucial.

We acknowledged several limitations in our study. First, this study was limited to the initial COVID-19 period where cases were predominantly imported. As the epidemic progressed, health-seeking behaviour might evolve and as such, an in-depth study would be useful to ascertain citizens' attitudes and responses. Second, the information collected was subjected to biases such as reporting, recall and acquiescence. Nevertheless, there were standard operating procedures in place to ensure the accuracy and consistency of information recorded.

## Conclusion

Our findings favour the proposition of every resident having one family doctor and underscore the importance of seeking early medical attention. This would facilitate early detection and isolation, hence limiting local transmission and enabling better control of the pandemic. In addition, given the high attendance rates of locally-acquired cases within primary care settings, policy makers could consider exploring additional roles in outbreak situations, such as establishing a comprehensive sentinel surveillance network comprising of all private and public clinics, to enable early detection of suspected cases within the community during different phases of a pandemic.

As our study did not delve into population healthcare literacy nor specific reasons for health-seeking behaviour, these could constitute future considerations to inform and enhance public health prevention strategies.

# Declarations

## Author Contribution

The study was designed by MPHST and MZT, while MZT did the literature review. LWA analysed the data and prepared the tables and figures. MZT drafted the manuscript, with LWA, WWE, VJML, YSL and MPHST critically reviewing the manuscript. All authors approved the final version of the manuscript.

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## Ethics approval and consent to participate:

Ethics approval for the study was obtained from the Domain Specific Review Board (DSRB) of National Healthcare Group, Singapore (2021/00063). The DSRB gave waiver for informed consent, as the data was collected under the Infectious Diseases Act.

**Consent for Publication:** Not applicable

**Competing interests:** The authors declare no competing interests.

**Availability of data and materials:** The data that support the findings of this study are available from the Ministry of Health, Singapore but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Ministry of Health.

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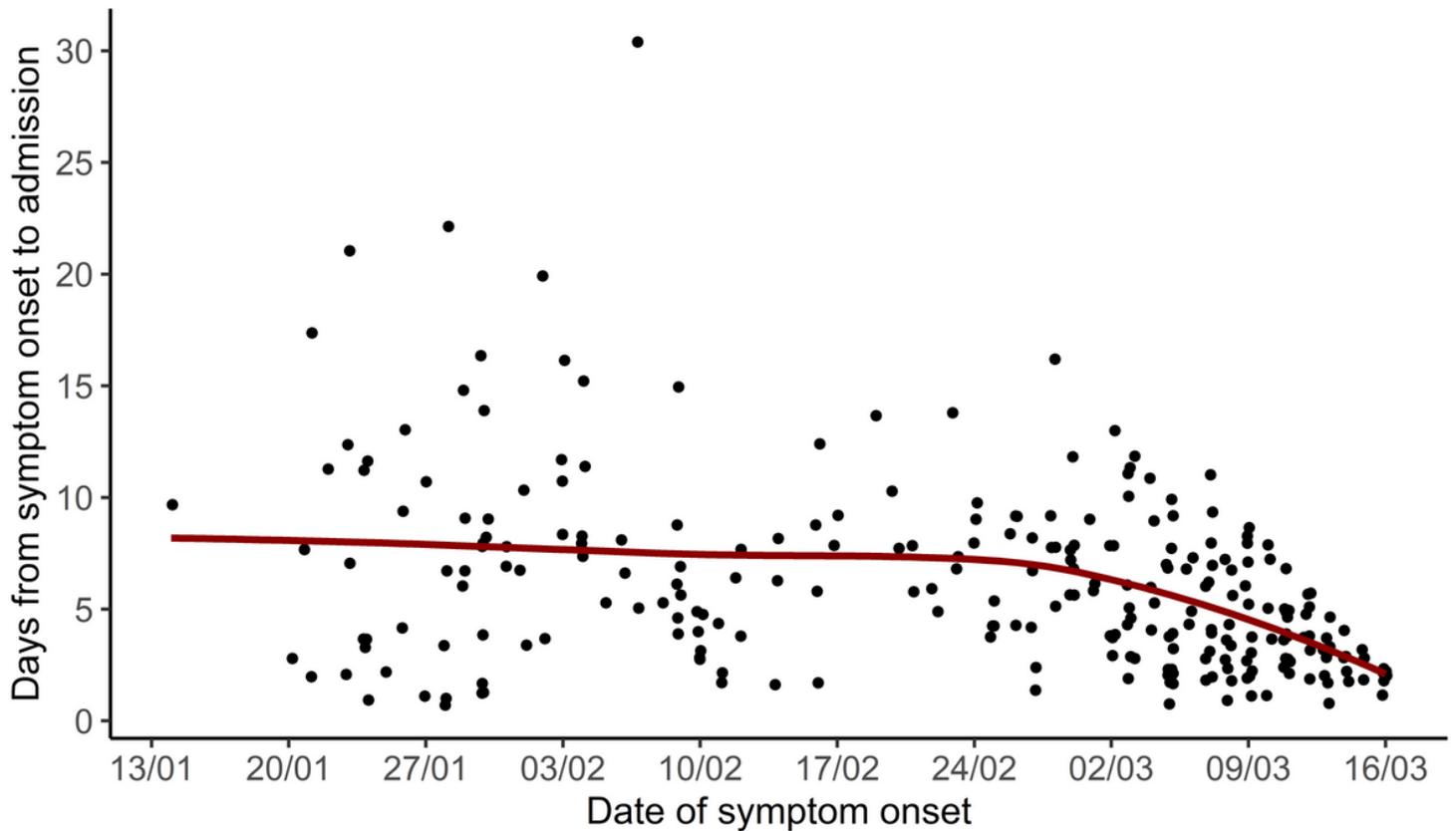
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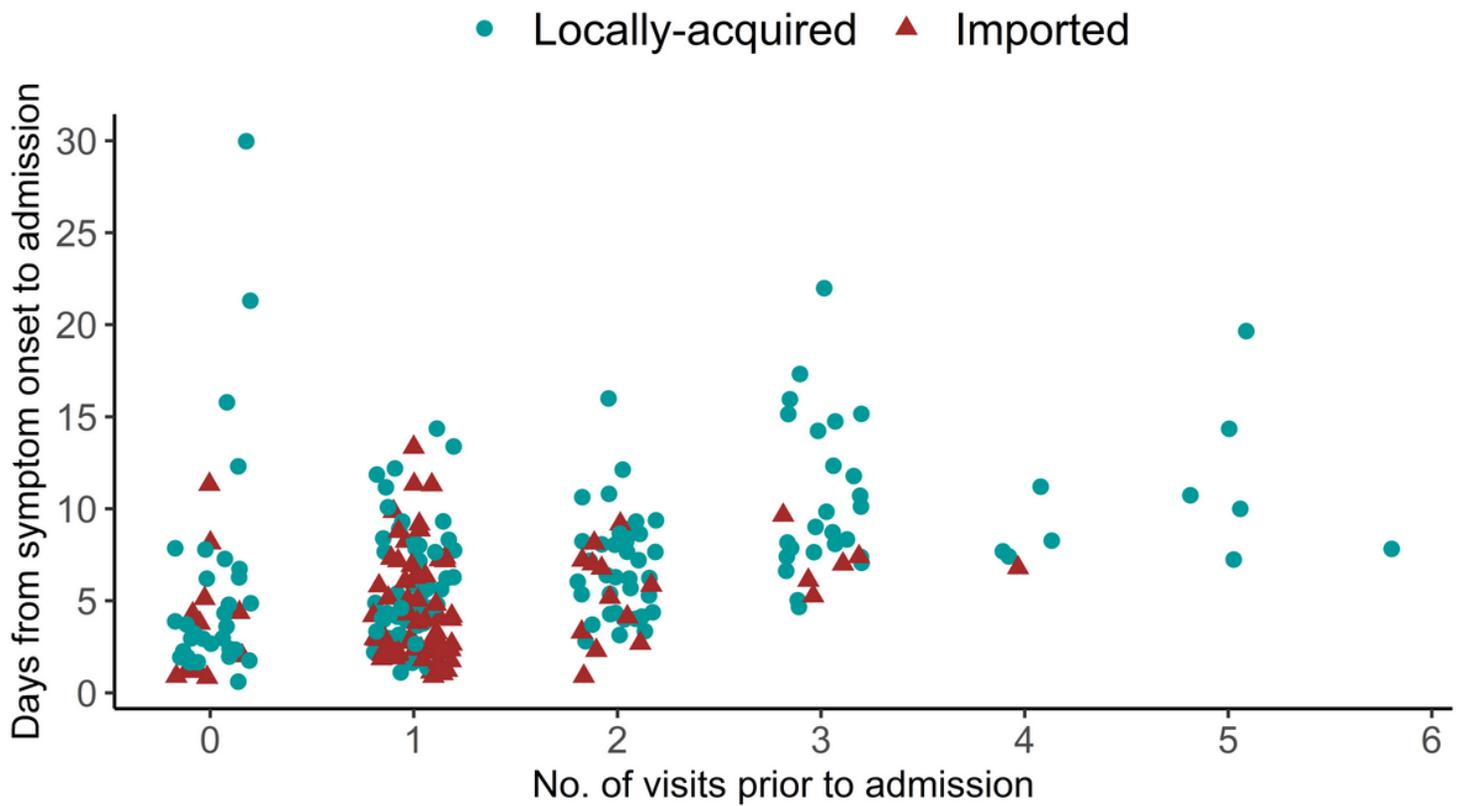
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## Figures



**Figure 1**

Approximately 21.7% of locally-acquired cases had 3 or more primary care / ED visits compared with 6.2% of imported cases ( $p=0.0007$ ). Locally-acquired cases had longer duration from symptoms onset to hospital admission (median 6 days, range 1-30) than imported cases (median 4 days, range 1-13) ( $p<0.0005$ ). The duration decreased as the epidemic progressed (Figure 1).



**Figure 2**

The number of primary care visits and duration from symptom onset to hospital admission exhibit a more widespread distribution among locally-acquired cases (Figure 2). There was a positive correlation between the number of visits prior to hospitalisation and duration from symptom onset to hospital admission (Spearman's  $\rho=0.461$ ,  $p<0.0005$ ).

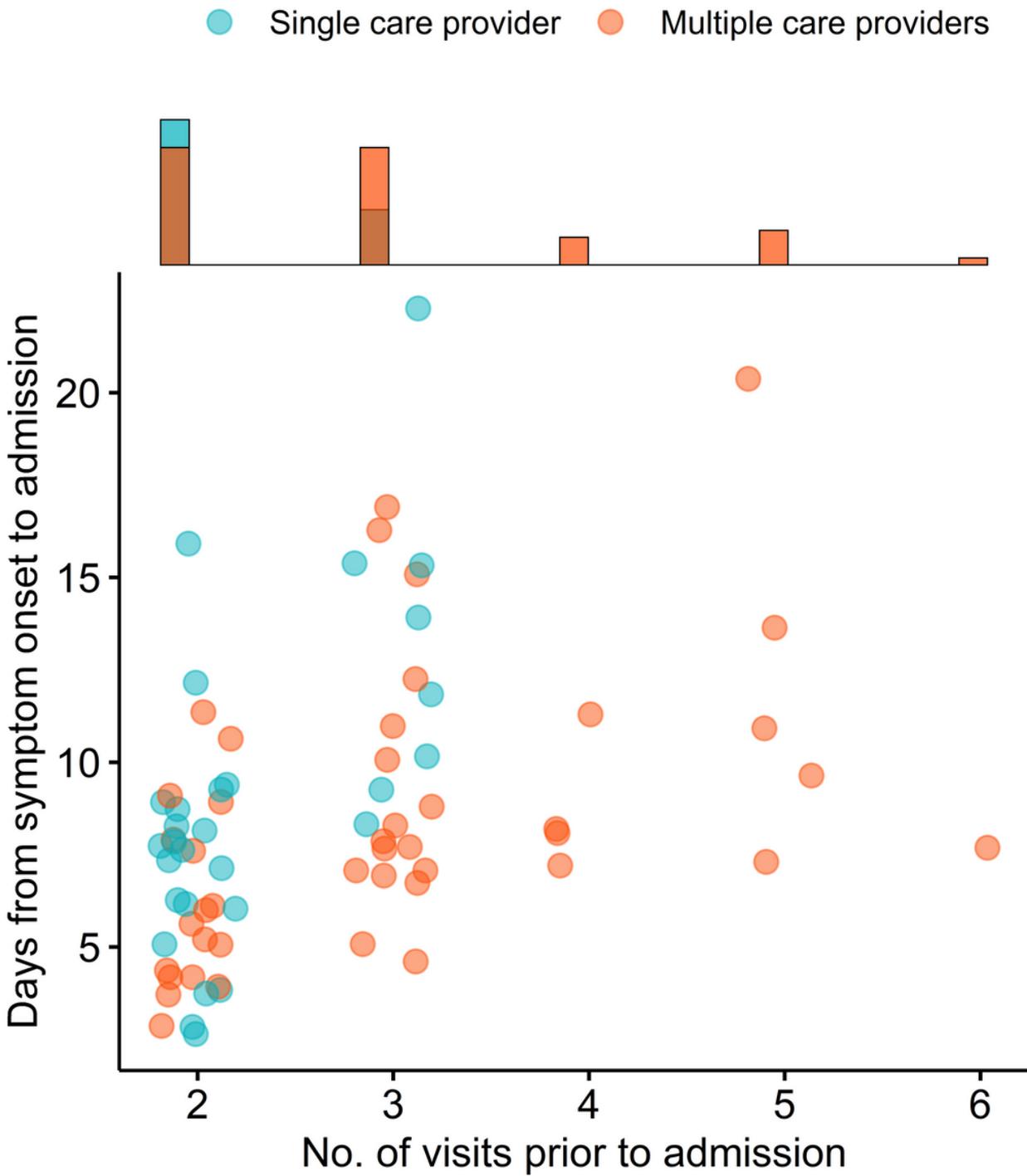


Figure 3

A higher proportion of cases who saw multiple providers (61.4%) had at least 3 visits compared with those who saw a single provider (27.6%) ( $p=0.008$ ). In addition, 72.4% of the latter group had 2 visits prior to their hospital admission (Figure 3). In contrast, those with multiple care providers had up to 6 visits.