Original Article

Public Awareness of Sepsis and Stroke in Singapore: A Population-Based Survey

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Abstract

Introduction: Management guidelines emphasise the importance of prompt therapeutic intervention for sepsis as well as stroke, both of which are common causes of death. Unfortunately, a rate-limiting step may be delayed presentation to the emergency department by patients themselves. The aim of this study was to assess public awareness of sepsis and stroke in Singapore. Materials and Methods: This was a population-based, structured telephone survey of adults in Singapore. Results: There were 1067 completed surveys (response rate 50.3%). The survey population was mostly comparable with the actual Singapore population. Fifty-three respondents (5.0%) had heard of the term sepsis. Of these, 45 respondents (4.2%) could provide at least one accepted definition of sepsis, the commonest being that of an unspecified infection. Respondents mostly heard about sepsis from school, the Internet, and newspapers. On the other hand, 963 respondents (90.3%) had heard of the term stroke. Of these, 818 respondents (76.7%) could name at least one accepted warning sign of stroke, the commonest being that of numbness, while 806 respondents (75.5%) could name at least one accepted risk factor for stroke, the commonest being hypertension. Respondents mostly heard about stroke from television, newspapers, a relative, a friend, media (unspecified), and the Internet. Conclusion: Our findings reflect the differences in the public profile of sepsis versus stroke in Singapore. More concerted efforts involving healthcare professionals, medical societies, statutory boards, and the mass media are required to improve public awareness of these 2 conditions —especially sepsis.

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Key words: Cerebrovascular disorders, Health knowledge, Infection, Questionnaires

Introduction

Sepsis and stroke are common diseases with several similarities. Firstly, they are both frequent causes of death. A recent review by Adhikari and colleagues based on data from the United States and the World Health Organization (WHO) suggested that sepsis kills more than 11,000 people per day,[1,2] while the 2004 WHO Global Burden of Disease project revealed that stroke causes at least 15,000 deaths daily.[2] In 2009, at least 17% of all deaths in Singapore were due to sepsis from pneumonia and urinary tract infection while 8% were due to cerebrovascular disease.[3] Secondly, they both require timely intervention. In an effort to improve mortality, the Surviving Sepsis Campaign guidelines recommend that a resuscitation bundle be performed for severe sepsis. This bundle includes blood cultures and broad-spectrum antibiotics within 3 hours of presentation to the emergency department, as well as early goal-directed therapy for haemodynamic derangements within 6 hours.[4] On a similar note, international guidelines recommend the use of intravenous tissue plasminogen activator within 4.5 hours of onset of acute ischaemic stroke to improve neurological outcomes.[5]

In addition to the ability of hospitals to meet these timelines, outcomes in sepsis and stroke also hinge on how early patients present to the emergency department. This depends largely on the ability of patients and bystanders to recognise these disorders. It is therefore of paramount importance that a healthcare system understands the public awareness (or lack thereof) of sepsis and stroke in any concerted efforts to improve outcomes. Multiple studies on stroke awareness have been done;[6] one of the most well-

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known includes a series of telephone surveys conducted in the Greater Cincinnati region of Ohio, the United States, which showed that more than two-thirds of respondents could now name at least one established stroke warning sign and one stroke risk factor.[7-9] In contrast, from the only telephone survey on sepsis awareness of its kind, Rubulotta and colleagues found that 88% of interviewees in France, Italy, Spain, the United Kingdom, and the United States had not heard of the term sepsis.[10] This may in part be due to sepsis being a heterogeneous and difficult-to-define entity.[11] The disparity between these landmark studies is intriguing, especially when one considers that both sepsis and stroke are common and potentially fatal. It is however important to note that these studies are not directly comparable, given the different designs and countries surveyed. In fact, Rubulotta and colleagues found that many more interviewees (53%) in Germany knew the word sepsis, thus underscoring the potential variation in public awareness across countries and the resultant need for local data.[10]

With these concerns in mind, we performed a population-based telephone survey in Singapore with the aim of assessing public awareness of both sepsis and stroke.

Materials and Methods

This was a telephone survey conducted from May to June 2010 of adults aged 21 years and older. As it did not involve any sensitive information or identifiers, the institutional review board exempted the study from formal review. In the sample size calculation, we sought to obtain a sample representative of the Singapore population. Based on statistics from the Singapore government, the national population in 2008 including residents and non-residents was 4,839,400.[12] To obtain a confidence interval of 95% and a confidence level of 3%, a sample size of 1067 telephone numbers was required. Assuming a response rate of 50%, we created a sampling frame of 2134 random telephone numbers from the 2010/2011 edition of the Singapore telephone directory. We stopped the telephone calls when 1067 completed surveys were obtained.

Twelve trained research nurses performed the telephone survey. If there was no answer at one of the selected telephone numbers, the number was called back repeatedly (a minimum of 5 callbacks) during the survey period. Callbacks were made during all possible times, including evenings, and Saturdays and Sundays. Only one respondent was interviewed per telephone number. If that respondent was unavailable, arrangements were made to call another time.

Singapore is a multi-racial country. While English is the language of instruction in schools, other spoken languages include Mandarin, Malay, and Tamil. As such, while the interviewers started the survey in English, they used a second language if the respondent so preferred. Translated versions in Mandarin and Malay were specially created before the study. Whenever necessary, another interviewer who was more proficient in the second language took over the survey. We pretested the survey instrument on a sample of 20 respondents and then made wording amendments to optimise question clarity.

The final survey instrument was a questionnaire which contained 3 sections. The first section concerned sepsis and was modified from the previous international survey by Rubulotta and colleagues.[10] The 4 questions, all of which were open-ended and without prompting, were:

1a. Have you heard of the term “Sepsis”, or not?

Only respondents who answered yes were directed to questions 1b to 1d, while those who answered no were directed to the second section.

1b. As far as you know, what is sepsis?

1c. Where did you hear about sepsis?

1d. Roughly how many people would you say die of sepsis around the world each day?

We considered the following definitions of sepsis to be correct answers: (i) blood poisoning; (ii) septicemia or leads to septicemia; (iii) septic shock or leads to septic shock; (iv) infection; (v) infection of a wound; (vi) infection of body tissue; (vii) the body’s response to infection; (viii) pus or pus in the body.[10,13] We accepted answers of at least 1000 deaths from sepsis each day as correct.[2]

The second section concerned stroke and was modified from surveys previously conducted in the Greater Cincinnati region and the third United States National Health and Nutrition Examination Survey.[7-9] The 5 questions, all of which were open-ended and without prompting, were:

2a. Have you heard of the term "Stroke", or not?

Only respondents who answered yes were directed to questions 2b to 2e, while those who answered no were directed to the third section.

2b. Please name up to 3 warning signs for stroke.

2c. Please name up to 3 risk factors for stroke.

2d. Where did you hear about stroke?

2e. Roughly how many people would you say die of stroke around the world each day?

We considered the following warning signs of stroke to be correct answers:[7-9,14] (i) sudden numbness or weakness of the face, arm, or leg, especially on one side of the body; (ii) sudden confusion or trouble speaking or understanding speech; (iii) sudden trouble seeing in one or both eyes; (iv) sudden trouble walking, dizziness, or loss of balance or coordination; and (v) sudden severe headache with no

known cause. We considered the following established risk factors for stroke as correct answers: (i) hypertension, (ii) smoking, (iii) heart disease, (iv) diabetes mellitus, (v) transient ischemic attack or prior stroke, (vi) heavy alcohol use, and (vii) hypercholesterolemia. We accepted answers of at least 1000 deaths from stroke each day as correct.[2]

The third section contained questions on the respondents' demographic data (age, sex, and ethnicity) and educational qualifications. The main ethnic groups in Singapore are the Chinese, Malays, and Indians. We classified educational qualifications into secondary levels and below (primary school, secondary school with the Singapore-Cambridge General Certificate of Education [GCE] Normal Level and Ordinary Level, and others), and post-secondary levels (Institute of Technical Education, polytechnic, pre-university with the GCE Advanced Level, and university).

We expressed categorical variables as number (%). To identify the independent predictors of knowledge on the definition of sepsis, stroke warning signs and stroke risk factors, we entered the following variables into a logistic regression model: age, sex, ethnicity, and level of education. We looked for multicollinearity and also assessed model fit using the Hosmer-Lemeshow goodness-of-fit test. We considered a *P* value of <0.050 statistically significant. We used PASW Statistics version 18.0 (SPSS Inc., Chicago, IL, USA).

Results

A total of 2132 telephone numbers were dialled, of which 10 were held by persons younger than 21 years age and hence deemed ineligible. Among the remaining 2122 numbers, 65 were not in used, 230 did not reach any respondents despite multiple callbacks, 682 persons refused to be surveyed, and 78 interviews could not be completed due to language difficulties. Thus there were 1067 completed surveys (response rate 50.3%).

The demographic distribution of the study respondents as compared to the resident population of Singapore based on the 2010 Singapore Census of Population are shown in Table 1.[15] The survey population was comparable with the general population in terms of ethnicity, but younger persons, females, and persons with a post-secondary education were mildly over-represented in the study. Demographic data of the non-respondents were unavailable.

Fifty-three (5.0%) out of the 1067 respondents had heard of the term sepsis. Of these, 45 respondents (4.2% of the study population) could provide at least one accepted definition of sepsis, while 8 respondents could not provide any definitions. Table 2 shows the definitions provided by the respondents, the commonest being that of an unspecified infection.

Table 1. Demographic Data of Study Respondents and Singapore Resident Population

	Study respondents n (%) (n = 1067)	**Singapore resident population[a] n (%) (n = 2,853,562)**
Age		
21 to 29 years	281 (26.3)	519,829[b] (18.2)
30 to 39 years	311 (29.1)	618,711 (21.7)
40 to 49 years	244 (22.9)	632,900 (22.2)
50 to 59 years	168 (15.7)	551,740 (19.3)
60 years and above	63 (5.9)	530,382 (18.6)
Sex		
Male	420 (39.4)	1,392,754 (48.8)
Female	647 (60.6)	1,460,808 (51.2)
Ethnicity		
Chinese	780 (73.1)	2,169,638 (76.0)
Malay	154 (14.4)	342,571 (12.0)
Indian	86 (8.1)	250,424 (8.8)
Others	47 (4.4)	90,929 (3.2)
Education		
Secondary and below	458 (42.9)	1,410,299[c] (51.5)
Primary school	86 (8.1)	
Secondary school N-level[d]	32 (3.0)	
Secondary school O-level[d]	270 (25.3)	
Others	70 (6.6)	
Post-secondary	609 (57.1)	1,326,001[c] (48.5)
Institute of Technical Education	39 (3.7)	
Polytechnic	335 (31.4)	
Pre-university A-level[d]	81 (7.6)	
University	154 (14.4)	

[a] Values are based on the Singapore Census of Population in the year 2010 and include Singapore citizens and permanent residents but exclude the non-resident population (reference 14)

[b] Values reflect all persons 20 years and above (instead of 21 years) based on data provided by the Census of Population 2010

[c] Values do not add up to 2853562 due to varying definitions used by the Census of Population 2010

[d] Singapore-Cambridge General Certificate of Education Normal Level, Ordinary Level, and Advanced Level

A total of 963 respondents (90.3%) had heard of the term stroke. Of these, 818 respondents (76.7% of the study population) could name at least one accepted warning sign of stroke, 4 respondents provided only non-accepted signs, and 141 respondents could not provide any sign. Table 3 shows the warning signs provided by the respondents,

Table 2. Definitions of Sepsis According to Respondents

Definition[a]	n	% based on respondents who have heard of sepsis (n = 53)	% based on all respondents (n = 1067)
Respondents with at least one accepted response	45	84.9	4.2
Infection (unspecified)	25	47.2	2.3
Blood poisoning	19	35.8	1.8
Septicemia or leads to septicemia	15	28.3	1.4
Infection of a wound	12	22.6	1.1
Pus or pus in the body	11	20.8	1.0
Septic shock or leads to septic shock	9	17.0	0.8
The body's response to infection	6	11.3	0.6
Infection of body tissue	3	5.7	0.3
Respondents with only other responses	0	0	0
Bacteria	11	20.8	1.0
Inflammation	11	20.8	1.0
An allergy	7	13.2	0.7
Respondents who have heard of sepsis but could not provide any definition	8	15.1	0.7
Respondents who have not heard of sepsis and hence did not provide any definition	1014	Not applicable	95.0

[a]Multiple responses allowed per person

Table 3. Warning Signs for Stroke According to Respondents

Warning sign[a]	n	% based on respondents who have heard of stroke (n = 963)	% based on all respondents (n = 1067)
Respondents with at least one accepted response	818	84.9	76.7
Numbness (any)	363	377	34.0
Weakness (any)	319	33.1	29.9
Trouble speaking	278	28.9	26.1
Trouble walking	220	22.8	20.6
Headache	194	20.1	18.2
Dizziness	175	18.2	16.4
Loss of balance	159	16.5	14.9
Numbness (one side)	132	13.7	12.4
Weakness (one side)	114	11.8	10.7
Confusion	113	11.7	10.6
Trouble seeing (any)	108	11.2	10.1
Trouble understanding speech	99	10.3	9.3
Loss of coordination	90	9.3	8.4
Trouble seeing (one eye)	53	5.5	5.0
Respondents with only other responses	4	0.4	0.4
Shortness of breath	97	10.1	9.1
Unspecified pain	92	9.6	8.6
Others	37	3.8	3.5
Respondents who have heard of stroke but could not provide any warning sign	141	14.6	13.2
Respondents who have not heard of stroke and hence did not provide any warning sign	104	Not applicable	9.7

[a]Multiple responses allowed per person

Table 4. Risk Factors for Stroke According to Respondents

Risk factor[a]	n	% based on respondents who have heard of stroke (n = 963)	% based on all respondents (n = 1067)
Respondents with at least one accepted response	806	83.7	75.5
Hypertension	418	43.4	39.2
Hypercholesterolemia	353	36.7	33.1
Smoking	236	24.5	22.1
Diabetes mellitus	129	13.4	12.1
Heart disease	125	13.0	11.7
Alcohol use	114	11.8	10.7
Transient ischemic attack	56	5.8	5.2
Prior stroke	52	5.4	4.9
Respondents with only other responses	58	6.0	5.4
Lack of exercise	244	25.3	22.9
Poor eating	220	22.8	20.6
Obesity	217	22.5	20.3
Stress	171	17.8	16.0
Family history of stroke	120	12.5	11.2
Others	18	1.9	1.7
Respondents who have heard of stroke but could not provide any risk factor	99	10.3	9.3
Respondents who have not heard of stroke and hence did not provide any risk factor	104	Not applicable	9.7

[a]Multiple responses allowed per person

the commonest being that of numbness. Meanwhile 806 respondents (75.5% of the study population) could name at least one accepted risk factor for stroke, 58 respondents provided only non-accepted risk factors, and 99 respondents could not provide any risk factor. Table 4 shows the risk factors provided by the respondents, the commonest being hypertension.

Respondents heard about sepsis from various sources, most commonly from school, the Internet, and newspapers (Fig. 1). The commonest sources for stroke were television, newspapers, a relative, a friend, media (unspecified), and the Internet (Fig. 2).

Using multivariable logistic regression analysis, the independent predictors of knowledge of an accepted definition of sepsis were the female sex and post-secondary education, the independent predictors of knowledge of at least one warning sign for stroke were younger age and post-secondary education, while the independent predictors of knowledge of at least one risk factor for stroke were ethnic group and post-secondary education (Table 5).

Discussion

Based on the findings of previous landmark surveys,[7-10] one would presume that public awareness of stroke exceeds that of sepsis. However, to the best of our knowledge, no data exist which quantify the actual discrepancy in knowledge of the 2 disorders in the same study population. The main findings of our study are as follows: only 5.0% of respondents had heard of the term sepsis, and only 4.2% could provide at least one accepted definition. In contrast, 90.3% of respondents had heard of the term stroke, 76.7% could name at least one accepted warning sign, and 75.5% could name at least one accepted risk factor.

While our results clearly show that the public in Singapore knows much more about stroke than sepsis, they are likely to reflect the situation in other developed countries. The proportion of respondents who have heard of the term sepsis is small in most surveyed countries: 4% in France, 8% in Italy, 13% in Spain, 14% in the United Kingdom, and 19% in the United States, as shown by Rubulotta and colleagues in their study of sepsis awareness.[10] Similarly, few respondents in these countries could define sepsis correctly. Many more studies on stroke awareness exist for comparison, with the ability to name at least one warning sign ranging from 25% to 100% across surveys.[6] Notable figures from some of the larger studies include: 49.8% in Newcastle, Australia in 1999, 82.3% in Michigan, the United States in 2004, and 68.0% in the greater Cincinnati region in 2005.[9,16,17] The ability to name at least one risk factor ranges from 18% to 97% in surveys,[6] e.g. 76.2% in Newcastle, 78.5% in Michigan, and 71.1% in the greater

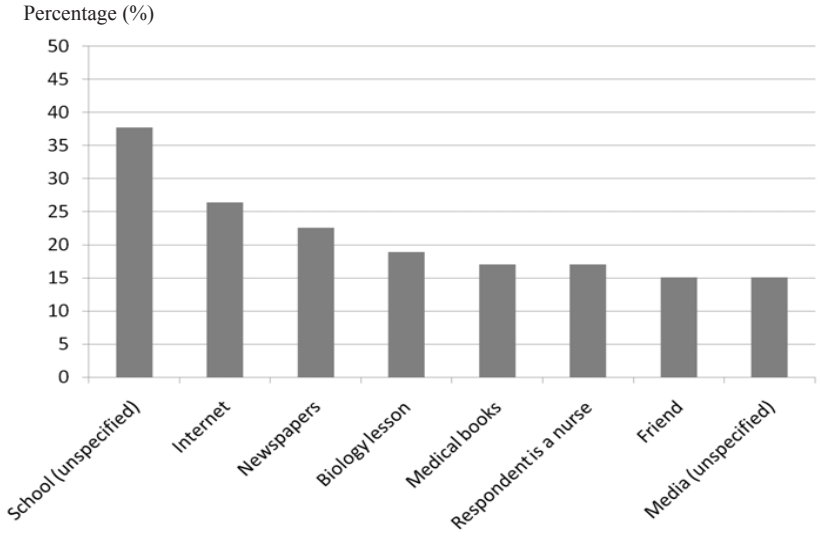

Fig. 1. Where respondents heard about sepsis (n = 53). Multiple responses allowed per person. Only the top eight sources are shown.

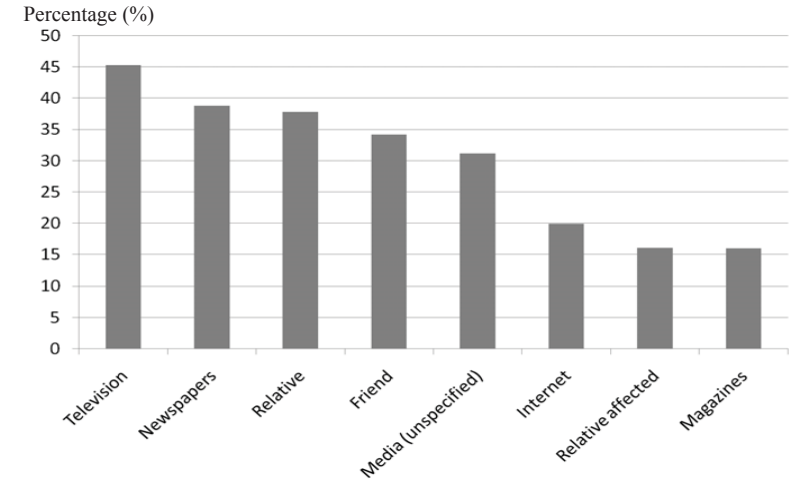

Fig. 2. Where respondents heard about stroke (n = 963). Multiple responses allowed per person. Only the top eight sources are shown.

Table 5. Significant Factors Associated with Knowledge of Sepsis and Stroke on Multivariable Logistic Regression

	At least one accepted definition of sepsis[a]		**At least one accepted warning sign for stroke[b]**		**At least one accepted risk factor for stroke[c]**	
Factor	**OR (95% CI)**	***P* value**	**OR (95% CI)**	***P* value**	**OR (95% CI)**	***P* value**
Age	1.05 (0.79 to 1.40) per 10 year increase in age	0.728	0.87 (0.77 to 0.99) per 10 year increase in age	0.030	1.06 (0.94 to 1.20) per 10 year increase in age	0.345
Female sex	2.16 (1.07 to 4.36)	0.032	1.10 (0.82 to 1.48)	0.530	1.08 (0.81 to 1.44)	0.612
Ethnicity						
Chinese	0.95 (0.22 to 4.15)[d]	0.944	1.18 (0.59 to 2.37)[d]	0.635	2.73 (1.48 to 5.04)[d]	0.001
Malay	0.82 (0.15 to 4.43)[d]	0.814	1.72 (0.78 to 3.80)[d]	0.180	3.79 (1.85 to 7.75)[d]	<0.001
Indian	1.90 (0.37 to 9.72)[d]	0.441	0.87 (0.38 to 2.00)[d]	0.741	2.50 (1.15 to 5.40)[d]	0.020
Others	---	0.428	---	0.190	---	0.003
Post-secondary education	5.25 (2.13 to 12.98)	<0.001	2.54 (1.87 to 3.46)	<0.001	2.37 (1.75 to 3.20)	<0.001

CI: confidence interval; OR: odds ratio

[a]Using the Hosmer-Lemeshow goodness-of-fit test on the model assessing definitions of sepsis, the χ^2 value was 4.644 with 8 degrees of freedom, $P = 0.795$

[b]For the model assessing stroke warning signs, the χ^2 value was 4.716 with 8 degrees of freedom, $P = 0.787$

[c]For the model assessing stroke risk factors, the χ^2 value was 8.995 with 8 degrees of freedom, $P = 0.343$.

[d]Odds ratio when compared to the "Others" ethnic group

Cincinnati region.[9,16,17]

Delayed administration of broad-spectrum antibiotics and fluids in severe sepsis,[4,18,19] and of intravenous tissue plasminogen activator in acute ischemic stroke compromise patient outcomes.[5,20,21] Public awareness campaigns for such acute illnesses should therefore convey several core messages: firstly, what the disease is, secondly, what the signs and symptoms are, and lastly how prompt presentation and intervention can improve outcomes.[22]

In the case of stroke, there has been fairly effective dissemination of the first 2 messages among the Singapore population, as evident by the fact that three-quarters of our respondents could name at least one warning sign and one risk factor. The flipside to this, however, is that one-quarter of the public remained ignorant. This was indeed the case in a recent study by De Silva and colleagues of acute ischemic stroke in a large tertiary hospital in Singapore, where 27% of patients and relatives did not recognise the signs of stroke, and 31% failed to understand the gravity of stroke. In this study, only 6% presented within 2 hours, and 15% presented within 3.5 hours of stroke onset.[23] Our findings and those of De Silva and colleagues highlight several cautionary notes. Firstly, stroke predominantly affects the older population which is less likely to know its warning signs.[6,16] Secondly, mere awareness of stroke warning signs does not naturally translate to earlier presentation to the emergency department.[24] The public must be educated on the narrow window of opportunity in which the potential benefits of intravenous tissue plasminogen activator may be harnessed,[5,9,22] and the importance of early supportive care such as haemodynamic, respiratory, fluid, and metabolic management as well as the prevention of complications.[5]

While we recognise deficiencies in stroke awareness, as many as 95.0% of our respondents had not heard of the term sepsis, let alone understand the syndrome and its presentation or treatment. It can be argued that as the term sepsis remains one that is predominantly used by the medical community, a lay person can potentially understand the manifestations and consequences of a severe infection without having heard of sepsis. This may especially be the case in Singapore where proficiency in the English language is not universal. Nonetheless, to mitigate this problem, we used translated versions of the questionnaire. In addition, although the term 'stroke' is no less medical in nature than the term 'sepsis', the difference in profile between the 2 terms is striking. We therefore suggest that the question as to why sepsis is so much less well known than stroke in developed countries must be answered.

Several possible reasons could explain this. Firstly, the definition and signs of stroke are relatively specific and easy to understand.[14] In comparison, even though an International Sepsis Definitions Conference was convened in 2001,[25] only 27% of 917 physicians in Brazil could recognise sepsis in a questionnaire study.[26] Another survey of 1058 doctors who looked after patients in intensive care units in Europe and the United States showed that only 17% agreed on one definition of sepsis.[11] In fact, 86% stated that the symptoms of sepsis could easily be misattributed to other conditions, while 85% described sepsis to patients' relatives as a complication of an underlying condition rather than as a diagnosis in itself. The same survey revealed that 46% of deaths from sepsis could have been misrecorded as deaths due to other diseases. Even the 2004 WHO Global Burden of Disease project did not name sepsis as a leading cause of death, and instead listed diagnoses like lower respiratory infections, diarrhoeal diseases, acquired immune deficiency syndrome, tuberculosis, various cancers, neonatal infections, diabetes mellitus, and malaria—all of which are likely to be associated with sepsis.[2] The same applies to statistics from Singapore's Ministry of Health.[3] With such ambivalence on the place of sepsis even in the healthcare profession, it comes as no surprise that public awareness is compromised. There is cause for optimism as various infectious diseases remain a pillar of high-impact research in Singapore,[27] albeit not quite under the umbrella term of sepsis. We recommend that our infectious disease physicians and intensivists now go one step further and work together with the Ministry of Health and medical schools to raise the profile of sepsis in the healthcare community.

Secondly, for decades, efforts have been taken to educate the public on stroke in Singapore.[28] The Singapore National Stroke Association is a stroke support group which conducts public seminars in community clubs, companies and hospitals, including an annual Stroke Awareness Week.[29] Admittedly, these efforts still cannot compare to the mass media campaigns in other countries, which have been shown to change social awareness and behaviour.[6,30] Nonetheless, many of our respondents have indeed learnt about stroke from the mass media. In contrast, there has been no concerted efforts to heighten public awareness of sepsis in Singapore, and very few of our respondents have heard of the syndrome from the media. Internationally, interest in public awareness of sepsis rose with the establishment of the Surviving Sepsis Campaign in 2002.[4] In the international survey by Rubulotta and colleagues, Germany stood out with 53% of their respondents having heard of sepsis.[10] Although many respondents still did not fully understand what sepsis meant, due credit may be given to education by the mass media and the German Sepsis Society.[31] In addition, the Global Sepsis Alliance was recently formed to help raise the profile of sepsis worldwide.[32] Our findings suggest that it is time that Singapore partakes in these global efforts. Use of the media (print and electronic including various broadcast and new media) and awareness campaigns with

public talks which are supported by the relevant medical societies and statutory boards are viable options. However, due consideration must be given to how best to educate the public, given the relatively non-specific nature of the symptoms of sepsis.[10,11]

Our study has several limitations which are inherent to telephone surveys. Firstly, telephone surveys worldwide are known to have lower response rates than other means of survey.[33] Singapore is no exception—a recently published study on the public perception of Singapore healthcare using a telephone survey method similar to ours achieved a response rate of 29.0%.[34] Our response rate of 50.3%, while acceptable, is not optimal and may lead to selection bias. We cannot estimate the direction and impact of this bias as we were unable to collect demographic data on the non-respondents. However, we note that the population of respondents had a generally comparable demographic profile with that of the actual Singapore population. Secondly, the use of the Singapore telephone directory to generate the sample population may have resulted in a selection bias toward fixed lines, which are listed more frequently in the directory than mobile lines. This bias is however mitigated by the high penetration (100.4%) of fixed telephone lines into Singaporean households.[35] To improve the response rate for unanswered calls, we made callbacks, even at night and on weekends.

Conclusion

While there is still some room for improvement in the public's knowledge of stroke in Singapore, a lot more work has to be done for sepsis. Our findings likely reflect not just the local situation but also the profile of sepsis versus stroke in the developed world. More concerted and organised efforts involving healthcare professionals, medical societies, statutory boards, and the mass media are required to improve public awareness of these 2 conditions. We believe this will assist in the goal of encouraging earlier presentations to the emergency department, thereby facilitating timely intervention and achieving better patient outcomes.

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