Stroke knowledge among middle and high school students

Abdullah B. Umar1, Tracy J. Koehler2, Reian Zhang1, Veronica Gilbert1, Muhammad U. Farooq3, Alan T. Davis2, David Nyenhuis3 and Philip B. Gorelick4

Abstract
Objective: To determine the awareness of stroke symptoms and risk factors in middle and high school students at a single institution.
Methods: An 11-question multiple-choice stroke awareness survey was administered to students in grades 7 to 12 at City High Middle School in Grand Rapids, Michigan, United States. Summary statistics were calculated.
Results: A total of 603/608 surveys were analyzed. Only 8% of respondents correctly identified stroke as the fifth leading cause of death in the United States. Half (50.1%) recognized that a stroke occurred in the brain. Sixty-seven students (11.1%) correctly identified all 11 stroke risk factors. Only 5.1% correctly selected all four correct stroke symptoms. Two-thirds (64.5%) recognized stroke as an immediate medical emergency. Slightly more than half (55.9%) knew the acronym FAST (face, arms, speech, time).
Conclusions: Most students in our study were unaware of all the risk factors and symptoms related to stroke. Although this study was limited because data were collected from only one school, the findings suggest a need to educate middle and high school students about stroke risk factors, symptoms and acute interventions.

1City High Middle School, Grand Rapids, MI, United States
2Scholarly Activity Support, Spectrum Health, Grand Rapids, MI, United States
3Mercy Health, Hauenstein Neurosciences, Grand Rapids, MI, United States
4Mercy Health, Hauenstein Neurosciences, Grand Rapids, MI, United States and Davee Department of Neurology, Northwestern University Feinberg School of Medicine, Chicago, IL, United States

Corresponding author: David Nyenhuis, Mercy Health, Hauenstein Neurosciences, 220 Cherry St. SE, Grand Rapids, Michigan 49503, United States.
Email: nyenhuda@mercyhealth.com
Introduction

Stroke is the fifth leading cause of death and a leading cause of adult disability in the United States. Most strokes (87%) are ischemic. This type of stroke is treated acutely by administering intravenous recombinant tissue plasminogen activator (rt-PA) therapy, the only intravenous treatment approved by the US Food and Drug Administration. There are restricted time windows in which the treatment interventions of rt-PA and mechanical thrombectomy can be considered for acute stroke patients; these include 4.5 hours and 24 hours, respectively, from when the patient was last seen well. Therefore, an important aspect of stroke care is timing, or what has been termed ‘time is brain’. If treatment is delayed, rt-PA potency and the beneficial effects of mechanical thrombectomy are substantially reduced. If untreated, a patient experiencing an ischemic stroke may lose 1.9 million neurons each minute. Most stroke patients do not reach hospital in a timely manner and thus are not eligible for rt-PA treatment. One reason for delayed hospital arrival time of stroke patients is inadequate stroke knowledge.

Public awareness and identification of basic stroke symptoms, particularly by family and friends or bystanders, is imperative to help ensure that proper, timely acute stroke treatment is received. Many studies have evaluated stroke knowledge in adult populations using interviews and surveys; however, youth and adolescent populations are typically not represented in stroke research. Some national and international studies have investigated stroke knowledge among adolescents, but more data are needed, particularly for urban samples. Therefore, we conducted a study to assess stroke knowledge among grade 7 to 12 middle and high school students from an urban public school in Grand Rapids, Michigan, USA. A secondary study aim was to compare stroke knowledge between grade levels, gender, race, body mass index (BMI) and parental education.

Methods

Study permission

The study was approved by the regulatory office of City High Middle School in Grand Rapids, MI. No subject consent was required because no identifiable data were collected.

Study design and survey administration

This cross-sectional study used a convenience sample of high school students in an urban setting. The research team members were trained to conduct the stroke survey by local stroke study experts in Grand Rapids. All grade 7 to 12 students present on April 19, 2018, at City High Middle School were surveyed. The school is an International Baccalaureate public high school; hence, some of the curriculum taught at City High Middle School does not correspond to traditional public school education. Each classroom was monitored by a member of the research team who introduced the survey and answered questions...
about the study before administration (Appendix A). Each classroom took approximately 10 to 15 minutes to complete the survey; however, students who required more time were allowed to stay until they had completed their questionnaire. Surveys were collected by the supervising investigator immediately after completion.

**Survey design**

The questionnaire included items to assess demographic information, general stroke knowledge, risk factors and symptoms, and emergency response information (Appendix A). Questions 1 to 7 were designed to test basic knowledge and understanding of stroke; for example, if there is another name for stroke (brain attack), which part of the body is affected by stroke, if pain is associated with stroke, if stroke is a leading cause of death in the USA and how stroke affects women as compared with breast cancer. Question 8 was designed to test awareness of stroke risk factors. Respondents were asked to select all the stroke risk factors they recognized from a list of 20 potential factors. This question was scored by assigning 0.5 points to each correct risk factor response. Incorrect or missed risk factor responses did not count against the respondent’s score. To limit response bias, surveys on which all 20 risk factors had been selected as correct received zero points for this question. The inclusion of pseudo-risk factors (e.g. energy drinks, long distance running, lead poisoning) also tested response bias. American Heart Association and American Stroke Association guidelines11 were used to generate the following 11 genuine risk factors: high blood pressure, high blood glucose, high cholesterol, smoking, narrowing of neck vessels, abnormal heart rhythm, a diet rich in cholesterol (e.g. fast foods), being overweight or obese, sedentary lifestyle/inactivity/lack of exercise, excessive use of alcohol and excessive use of recreational drugs. The maximum possible score for this question was 5.5 (11 possible correct answers).

Question 9 tested stroke symptom knowledge. This question was assessed in the same way as question 8 in terms of point distribution and bias control. Of the possible symptom choices, only four were correct: sudden trouble seeing in one or both eyes, drooping on one side of the face, sudden slurred speech or confusion, and sudden headache with no known cause. The maximum possible score for this question was 2 because each correct response was worth 0.5 points.

Question 10 tested the ability to recognize stroke as a medical emergency. To receive a point for this question, the respondent was required to select option 3, ‘Call 911’. Selection of any other response was considered incorrect.

Question 11 tested the respondents’ ability to identify the FAST (facial droop, arm weakness, speech difficulty, time) acronym, which is used as a mnemonic device to identify the initial stroke signs.

**Statistical analysis**

Summary statistics were calculated for the sample data. Quantitative data are shown as the mean ± standard deviation. Nominal data are shown as percentages. The relationship between age and stroke knowledge score was assessed using the Pearson correlation coefficient. One-way analysis of variance (ANOVA) was used to determine differences in stroke knowledge by grade level, gender, race, BMI and parental education. If the ANOVA analysis was significant, pairwise comparisons were performed using Tukey’s test. Significance was assessed at $P < 0.05$. All analyses were performed using IBM SPSS
Statistics, Version 23 (IBM Corp., Armonk, NY, USA).

Results
A total of 608 surveys were collected, of which 5 had missing data on stroke knowledge. The 608 surveys accounted for 69.9% of the school’s population because there were 863 enrolled grade 7 to 12 students at the time of the survey. Respondent characteristics for the 603 surveys that were analyzed are described in Table 1. The percentage of stroke-based knowledge questions with one correct response is shown in Table 2. The average score on the stroke-based knowledge portion of the questionnaire was 8.6 ± 2.5 points. Only 8% of respondents correctly identified stroke as the fifth leading cause of death in the United States. Half of students (50.1%) recognized that a stroke occurred in the brain. Sixty-seven students (11.1%) correctly identified all 11 stroke risk factors, but only 5.1% correctly selected all four correct stroke symptoms. Two-thirds (64.5%) recognized stroke as an immediate medical emergency. Slightly more than half of participants (55.9%) knew the acronym FAST. Notably, there was a statistically significant, although weak, positive correlation between age and stroke knowledge scores (P < 0.001; r = 0.18).

Table 1. Respondent characteristics.

| Characteristic                      | Value     |
|-------------------------------------|-----------|
| Age (years)*                        | 14.8 ± 1.7|
| Gender                              |           |
| Male                                | 273/592 (46.1%) |
| Female                              | 297/592 (50.2%) |
| Other                               | 22/592 (3.7%) |
| Race                                |           |
| Caucasian                           | 280/587 (47.7%) |
| Hispanic                            | 115/587 (19.6%) |
| Black or African American           | 48/587 (8.2%) |
| Asian                               | 40/587 (6.8%) |
| Multiracial                         | 94/587 (16.0%) |
| Other                               | 10/587 (1.7%) |
| Parental education – some college education or above | |
| Mother                              | 386/582 (66.3%) |
| Father                              | 313/581 (53.9%) |

*Data are means ± standard deviations.

Table 2. Respondent stroke-based knowledge.

| Stroke-based knowledge                          | % Correct |
|------------------------------------------------|-----------|
| Stroke occurs in the brain                     | 302/603 (50.1%) |
| Another name for stroke is ‘brain attack’      | 185/603 (30.7%) |
| Women are more likely to die from breast cancer than from stroke (False) | 315/603 (52.2%) |
| Pain is the most common symptom of stroke (False) | 409/603 (67.8%) |
| Stroke is the 5th leading cause of death in the USA | 48/603 (8.0%) |
| Heart disease causes more deaths than stroke   | 329/603 (54.6%) |
| Children, teens, adults and seniors are all at risk of stroke | 282/603 (46.8%) |
| Stroke is an emergency and you should call 911 when you see someone having a stroke | 389/603 (64.5%) |
| Awareness of the acronym FAST                  | 337/603 (55.9%) |

Subanalyses
Table 3 shows comparisons of stroke knowledge scores for gender, race, BMI, grade level and parental education levels. No significant differences were observed for gender, BMI or father’s education level.
Table 3. Subgroup survey score comparisons*.

| Variable                      | n    | Score ± | P-value      |
|-------------------------------|------|---------|-------------|
| **Gender**                    |      |         |             |
| Male                          | 273  | 8.7 ± 2.4| 0.49†       |
| Female                        | 297  | 8.5 ± 2.5|             |
| Other                         | 22   | 8.1 ± 3.1|             |
| **Race**                      |      |         |             |
| Asian                         | 40   | 8.9 ± 2.6| <0.001a     |
| Black or African American     | 48   | 8.4 ± 2.7|             |
| Caucasian                     | 280  | 9.0 ± 2.6a|            |
| Hispanic                      | 115  | 7.7 ± 2.1a|            |
| Multiracial                   | 94   | 8.5 ± 2.3|             |
| Other                         | 10   | 8.1 ± 3.3|             |
| **BMI category (kg/m²)**      |      |         |             |
| Underweight (<18.5)           | 127  | 8.8 ± 2.3| 0.37†       |
| Normal weight (18.5 to <25)   | 309  | 8.5 ± 2.4|             |
| Overweight (25 to <30)        | 64   | 8.6 ± 2.7|             |
| Obese (≥30)                   | 26   | 9.3 ± 2.0|             |
| **Grade**                     |      |         |             |
| 7th                           | 66   | 8.0 ± 2.1a,b| 0.04a, 0.001b, 0.006c, |
| 8th                           | 150  | 8.0 ± 2.1c,d| <0.001d, 0.004e |
| 9th                           | 113  | 8.3 ± 3.0c|             |
| 10th                          | 110  | 9.1 ± 2.3a,c|            |
| 11th                          | 84   | 9.5 ± 2.3b,d,e|        |
| 12th                          | 72   | 8.9 ± 2.6|             |
| **Father’s education**        |      |         |             |
| Did not complete high school  | 77   | 8.0 ± 2.4| 0.158†      |
| High school/GED               | 76   | 8.4 ± 2.3|             |
| Some college                  | 70   | 8.7 ± 2.8|             |
| Bachelor’s degree             | 108  | 9.1 ± 2.4|             |
| Master’s degree               | 96   | 8.5 ± 2.8|             |
| Advanced grad work/PHD        | 39   | 8.6 ± 2.4|             |
| Not sure                      | 115  | 8.4 ± 2.2|             |
| **Mother’s education**        |      |         |             |
| Did not complete high school  | 52   | 7.5 ± 2.5a,b| 0.015a, 0.028b |
| High School/GED               | 59   | 8.6 ± 2.3|             |
| Some college                  | 76   | 9.0 ± 2.4a|             |
| Bachelor’s degree             | 134  | 8.8 ± 2.6b|             |
| Master’s degree               | 107  | 8.3 ± 2.6|             |
| Advanced grad work/PHD        | 49   | 8.8 ± 2.7|             |
| Not sure                      | 105  | 8.7 ± 2.2|             |

*Data are mean ± standard deviations. BMI: body mass index; GED: General Education Development.
†A letter shared by two groups denotes significant differences between those groups; all other comparisons, P > 0.05.
Overall P-value for ANOVA; pairwise comparisons were not performed.
Race
Caucasian students scored significantly higher than Hispanic students on overall stroke knowledge \((P < 0.001)\). Similar scores were noted across other race categories.

Grade level
The 7th grade students scored significantly lower than 10th graders \((P = 0.04)\) and 11th graders \((P = 0.001)\). The 8th grade students scored significantly lower than 10th graders \((P = 0.006)\) and 11th graders \((P < 0.001)\). The 9th grade students scored significantly lower than 11th grade students \((P = 0.004)\). No other significant differences between grade levels were noted.

Parental education level
Students whose mothers did not complete high school scored on average significantly lower than those whose mothers had a bachelor’s degree \((P = 0.028)\) or some college education \((P = 0.015)\). No other significant differences were noted.

Discussion
Our results suggest that stroke knowledge among middle school and high school students is relatively lower than reported for other studies from different countries.\(^6\)\(^,\)\(^7\)\(^,\)\(^12\) This lack of knowledge of stroke risk factors and symptoms is a major public health challenge because stroke is common and may present as a medical emergency. Of our respondents, 64.5\% reported that they would call 911 in case of a stroke and only 55.9\% were aware of the acronym FAST. Therefore, there is a potential need to educate adolescents about stroke. The relatively high recognition of the acronym FAST was probably a result of increased awareness of the term created by the medical club members during stroke awareness month, which preceded the questionnaire administration.

The establishment of a healthier lifestyle during adolescence is potentially important for decreasing the occurrence of stroke in later life. Overall knowledge of stroke symptoms and risk factors is low in youths and adolescents. However, youths can be educated about stroke risk factors and how to respond to a medical emergency by increasing awareness of stroke and its risk factors and symptoms. A stroke educational program in Texas, which educated 325,000 children about the symptoms of stroke and importance of early treatment, helped to increase the number of stroke patients treated with t-PA in the local area.\(^8\) A study of Korean high school students showed a significant increase (33\%) in recognition of stroke risk factors immediately after a 50-minute lecture.\(^9\) The results of ‘Hip-Hop Stroke’, a New York school-based stroke communication intervention and stroke literacy program, suggest that educating 5th and 6th grade public school students about stroke is an effective way to increase their parents’ awareness of stroke.\(^13\) A study from Portugal involving 8th grade students and one of their parents in seven public schools showed that school-based interventions may improve stroke knowledge in middle school students and their parents.\(^10\)

Various educational campaigns could be implemented, not only in school curricula, but also at public events. Educating groups of students through seminars may help to improve stroke knowledge. The use of posters, television and radio advertisements, and the distribution of flyers could also improve stroke knowledge. Proper cardiovascular and stroke education is important for adolescents because their future cardiovascular and brain health may be based on current habits and behaviors.

Our data showed little difference in stroke knowledge and awareness between
high school age boys and girls. In contrast, several previous studies indicate that women may have better recognition of stroke risk factors and symptoms and better general stroke knowledge.\textsuperscript{14,15} However, our study population comprised students with very comparable education levels, which may explain the lack of difference between boys and girls. Similar findings were reported in a study of high school students in Nepal;\textsuperscript{6} a non-significant correlation was reported for knowledge and gender, although boys were able to identify stroke risk factors and symptoms slightly better than girls.\textsuperscript{6}

Our study participants were asked to select from the following racial group choices: Caucasian, Black or African American, Asian American, Native American, Hispanic, and Asian. The question also had an ‘Other’ option, which allowed students to add their given race if not listed. Those who selected more than one category were combined into a multiracial group. Hispanics achieved the lowest average scores whereas Caucasians achieved the highest average scores. A study that analyzed data collected from various Spanish-speaking populations in South America, Latin America and Spain identified a problem with participants’ understanding of the term ‘ictus’, which is the word for ‘stroke’ in Spanish.\textsuperscript{16} Almost none of the respondents in this previous study associated ‘ictus’ with stroke; the closest term to ‘stroke’ was ‘embolia’ (embolism), which was recognized by a larger portion of the Spanish-speaking participants.\textsuperscript{16} This language barrier may partly explain why our Hispanic participants had less knowledge of stroke, assuming that they grew up speaking Spanish. This is a major concern because Hispanics may have a higher risk of stroke because they tend to have higher rates of obesity and diabetes mellitus, and are less physically active.\textsuperscript{17} As in other studies,\textsuperscript{18} we found that African American participants had lower stroke knowledge than other ethnic groups, especially Caucasians (although they scored higher than Hispanic students).

Diet is another factor linked to stroke risk. There is a relationship between an unhealthy diet and a poor metabolic profile.\textsuperscript{19} A study of Nigerian secondary school students found that students considered obese had less knowledge of stroke risk factors and symptoms.\textsuperscript{12} This pattern was not observed in our study; obese students had a better understanding of stroke risk factors and stroke signs and symptoms than normal weight and underweight students. This could be because primary care physicians emphasize stroke risk factors to individuals with poor diets and sedentary lifestyles.

Socioeconomic status is a primary predictor of health. According to one survey of approximately 2,400 adults, educational level, income, employment status and health are independent predictors of stroke knowledge.\textsuperscript{20} In our survey, we used the surrogate measure of parental education level to assess the contribution of socioeconomic status to stroke knowledge. When surveyed, parents with a higher education level tended to have better awareness of stroke.\textsuperscript{21} Therefore, students’ awareness of stroke may be linked to the education level of their parents. We found no relationship between survey scores and father’s level of education. However, there was a significant association, although no real trends, between survey scores and mother’s level of education.

There are several study limitations. A main limitation is that the results were drawn from a specialized student base from one school, which raises the possibility of selection bias. Furthermore, the academic rigor and the relatively high diversity at our school mean that the findings may not be generalizable to many middle schools and high schools in the USA. These
characteristics of the school may contribute to the relatively high level of stroke knowledge found. Because there was no comparison population, the data may not be fully representative of all high school and middle school students in Michigan or nationwide.

We attempted to limit patterned responses for questions 8 and 9 by including non-stroke risk factors and symptoms. Previous studies show that closed-ended surveys such as used here produce higher scores than open-ended surveys. The responses to open-ended questions reveal exactly what the respondent knows. In contrast, closed-ended questions make it easier for respondents to guess the correct answer. Response bias may also have affected the present results. To limit this, future studies should add an ‘unsure’ option to the ‘yes’ and ‘no’ options.

Conclusion
Data from studies such as this provide information about awareness of stroke among youths; however, additional studies in different school systems and states are warranted. Our next step is to conduct a similar study after educating the City High Middle School students about which interventions may be effective for educating youths about stroke risk factors and signs and symptoms.

Declaration of conflicting interest
The authors declare that there is no conflict of interest.

Funding
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ORCID iD
Abdullah B. Umar https://orcid.org/0000-0003-3394-609X

David Nyenhuis https://orcid.org/0000-0001-7318-2915

References
1. Writing Group Members, Mozaffarian D, Benjamin EJ, et al. Heart disease and stroke statistics-2016 update: a report from the American Heart Association. Circulation 2016; 133: e38–e360.
2. Powers WJ, Rabinstein AA, Ackerson T, et al. 2018 Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke 2018; 49: e46–e110.
3. Saver JL. Time is brain—quantified. Stroke 2006; 37: 263–266.
4. Adeoye O, Hornung R, Khatri P, et al. Recombinant tissue-type plasminogen activator use for ischemic stroke in the United States: a doubling of treatment rates over the course of 5 years. Stroke 2011; 42: 1952–1955.
5. Siddiqui M, Siddiqui SR, Zafar A, et al. Factors delaying hospital arrival of patients with acute stroke. J Pak Med Assoc 2008; 58: 178–182.
6. Thapa L, Sharma N, Poudel RS, et al. Knowledge, attitude, and practice of stroke among high school students in Nepal. J Neurosci Rural Pract 2016; 7: 504–509.
7. Farooq MU, Bhatt A, Safdar A, et al. Stroke symptoms and risk factor awareness in high school children in Pakistan. Int J Stroke 2012; 7: E15.
8. Morgenstern LB, Gonzales NR, Maddox KE, et al. A randomized, controlled trial to teach middle school children to recognize stroke and call 911: the kids identifying and defeating stroke project. Stroke 2007; 38: 2972–2978.
9. Park H, Jeong J, Lee H, et al. Stroke awareness in Korean high school students. Acta Neurol Belg 2017; 117: 455–459.
10. Marto JP, Borbinha C, Filipe R, et al. Impact of stroke education on middle school students and their parents: a cluster randomized trial. Int J Stroke 2017; 12: 401–411.
11. Meschia JF, Bushnell C, Boden-Albala B, et al. Guidelines for the primary prevention of stroke: a statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke 2014; 45: 3754–3832.
12. Komolafe MA, Obembe AO, Olaogun MO, et al. Awareness of stroke risk factors and warning signs in Nigerian adolescents compared with adults. J Stroke Cerebrovasc Dis 2015; 24: 687–693.
13. Williams O, DeSorbo A, Noble J, et al. Child-mediated stroke communication: findings from Hip Hop Stroke. Stroke 2012; 43: 163–169.
14. Reeves MJ, Hogan JG and Rafferty AP. Knowledge of stroke risk factors and warning signs among Michigan adults. Neurology 2002; 59: 1547–1552.
15. Schneider AT, Pancioli AM, Khoury JC, et al. Trends in community knowledge of the warning signs and risk factors for stroke. JAMA 2003; 289: 343–346.
16. Hawkes MA, Ameriso SF and Willey JZ. Stroke knowledge in Spanish-speaking populations. Neuroepidemiology 2015; 44: 121–129.
17. Cruz-Flores S, Rabinstein A, Biller J, et al. Racial-ethnic disparities in stroke care: the American experience: a statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke 2011; 42: 2091–2116.
18. Sharrief AZ, Johnson B, Abada S, et al. Stroke knowledge in African Americans: a narrative review. Ethn Dis 2016; 26: 255–262.
19. Suliga E, Koziel D, Cieśla E, et al. Association between dietary patterns and metabolic syndrome in individuals with normal weight: a cross-sectional study. Nutr J 2015; 30: 14–55.
20. Ramirez-Moreno JM, Alonso-Gonzalez R, Peral Pacheco D, et al. Effect of socioeconomic level on knowledge of stroke in the general population: a social inequality gradient. Neurologia 2016; 31: 24–32.
21. Ramirez-Moreno JM, Alonso-Gonzalez R, Peral Pacheco D, et al. Stroke awareness is worse among the old and poorly educated: a population-based survey. J Stroke Cerebrovasc Dis 2015; 24: 1038–1046.

APPENDIX A

Study ID ________

Hello everyone! Thank you for taking the time to help City High’s Medical Club conduct this survey. In front of you, there is a survey/questionnaire that consists of questions about awareness of stroke symptoms and risk factors. Your responses are anonymous, so please don’t write your name on the survey. It is very important that you take this survey seriously and answer the questions to the best of your ability. The information will be valuable to the community as it will allow the City High Medical Club to spread awareness about stroke, to potentially save lives by preventing stroke, and to possibly help stroke victims. If you have any questions, raise your hand and we will be happy to address them.

1. In what part(s) of the body does a stroke occur? (Circle all that apply)

   Heart  Lungs  Brain  Kidneys  Stomach

2. What is another name for stroke? (Circle all that apply)

   Heart attack  Seizure  Brain attack  Hay fever  Pneumonia
3. Women are more likely to die from breast cancer than from stroke. (Circle only one)
   True   False

4. The most common sign of a stroke is pain. (Circle only one)
   True   False

5. Stroke is which leading cause of death in the USA? (Circle only one)
   1st   2nd   3rd   4th   5th   6th

6. Stroke causes more deaths than heart disease in the USA. (Circle only one)
   True   False

7. Who is affected by stroke? (Check all that apply)
   Children & Infants _____
   Teens & Young Adults _____
   Adults _____
   Seniors _____

8. Which of the following are known to increase the risk of stroke? (Check all that apply)
   I. High blood pressure ______
   II. Energy drinks ______
   III. Recreational drugs such as cocaine ______
   IV. Long distance running ______
   V. High blood sugar ______
   VI. Concussion ______
   VII. High cholesterol ______
   VIII. Smoking ______
   IX. Narrowing of neck vessels ______
   X. Abnormal heart rhythm ______
   XI. A diet rich in cholesterol (e.g. fast foods) ______
   XII. Excessive use of fish ______
   XIII. A diet rich in salt ______
   XIV. Being overweight or obese ______
   XV. Sedentary life style, inactivity and lack of exercise ______
   XVI. Excessive use of alcohol ______
   XVII. Lead poisoning ______
   XVIII. Snoring ______
   XIX. Playing videos games for more than 1 hour a day______
   XX. Less than 6 hours of sleep in 24 hours ______
9. Which of the following are common signs/symptoms of stroke? (Check all that apply)

I. Sudden trouble seeing in one or both eyes ______  
II. One side of the face may droop ______  
III. Sudden slurred speech or confusion ______  
IV. Sudden headache with no known cause ______  
V. Sudden numbness involving the whole body ______  

10. What should you do if you think someone is having a stroke? (Check only one)

I. Tell them to lie down and take a nap ______  
II. Call the family doctor to make an appointment ______  
III. Call 911 ______  
IV. Tell them to drink lots of water ______  
V. Tell them to take aspirin ______  

11. What does the acronym FAST stand for? (Check only one)

I. Fluctuating consciousness – Altered thinking – Speech difficulties – Tinnitus (ear ringing) _____  
II. Facial drooping – Arm Weakness – Speech difficulties – Time _____  
III. Facial drooping – Altered thinking – Stuttering – Time _____  
IV. Fluctuating consciousness – Altered thinking – Speech difficulties – Time _____  
V. Flickering vision – Altered taste sensation – Stuttering – Tinnitus (ear ringing) _____  

That’s all the stroke questions. Now, please tell us a bit about yourself———

Age ______  
Current Grade ______  
Gender: ♀ Male ♂ Female ♂ Other (Circle only one)  
Race/Ethnicity: (Circle all that apply)  
Caucasian, Black or African American, Asian American, Hispanic, Native American, Asian, Other  

Height feet _____ inches _____  
Approximate weight ________  

What is the highest level of education completed by your father? (Check only one)

-Did not complete high school ____  
-High school/GED_____  
-Some college _____  
-Bachelor’s degree ______  
-Master’s degree _____  
-Advanced graduate work or PhD _____  
-Not sure _____
What is the highest level of education completed by your mother? (Check only one)

- Did not complete high school ____
- High school/GED ____
- Some college ______
- Bachelor’s degree ______
- Master’s degree ______
- Advanced graduate work or PhD_______
- Not sure ______

How many people live in your house on a regular basis?:

Do you smoke cigarettes? Yes No (Circle only one)
Do you drink alcohol on a regular basis? Yes No (Circle only one)

Thank you! If you have any questions regarding stroke, please raise your hand.