

# KIDS IDENTIFYING AND DEFEATING STROKE (KIDS): DESIGN OF A SCHOOL-BASED INTERVENTION TO IMPROVE STROKE AWARENESS

**Background:** We describe the design and baseline data of an educational intervention targeting predominantly Mexican American middle school students and their parents in an effort to improve stroke awareness. Increasing awareness in this group may increase the number of patients eligible for acute stroke treatment by encouraging emergency medical services (EMS) activation.

**Methods:** This is a prospective, randomized study in which six middle schools were randomly assigned to receive a stroke education program or the standard health class. Primary outcome measures are the percentage of students and parents who recognize stroke symptoms and express the intent to activate EMS upon recognition of these findings.

**Results:** A total of 547 students (271 control, 276 intervention) and 484 parents (231 control, 253 intervention) have been enrolled. Pretests were administered. The intervention has been successfully carried out in the parent and student cohorts over a three-year period. Post-tests and persistence test results are pending.

**Conclusion:** Implementing a school-based stroke education initiative is feasible. Follow-up testing will demonstrate whether this educational initiative translates into a measurable and persistent improvement in stroke knowledge and behavioral intent to activate EMS upon recognition of stroke symptoms. (*Ethn Dis.* 2007;17:320-326)

**Key Words:** Acute, Education, School, Stroke, Treatment

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## BACKGROUND

Stroke is the number one cause of disability and the third leading cause of death in the United States.<sup>1</sup> Intravenous recombinant tissue plasminogen activator (rt-PA), given within the first three hours of symptom onset, is the only US Food and Drug Administration (FDA)-approved treatment for acute ischemic stroke (AIS). Currently, <5% of stroke patients receive this therapy.<sup>2,3</sup> The main reason for underutilization of rt-PA is failure to arrive at the hospital within the three-hour window.<sup>4</sup> As future therapies are likely to have similar time constraints, increasing the number of patients eligible for AIS treatment is paramount. The factor that contributes most to delays is the use of emergency medical services (EMS) transport.<sup>5,6</sup> Since family members are most often responsible for initiating calls to EMS for AIS,<sup>7</sup> increasing stroke symptom awareness in this group may increase the number of patients who arrive at the emergency department within the three-hour window.

Hispanics are the largest minority group in the United States, and Mexican Americans are the largest subgroup.<sup>8</sup> Mexican Americans have a higher incidence of ischemic stroke than do non-Hispanic Whites and tend to have their strokes at younger ages.<sup>9-13</sup> While studies demonstrate a lack of knowledge about stroke symptoms, risk factors, and treatment in both Mexican Americans and non-Hispanic Whites, the knowledge barrier is more pronounced among Mexican Americans.<sup>14-16</sup> This knowledge barrier may translate into delayed presentation to

the emergency department (ED) and, subsequently, lower rt-PA treatment rates. One way to increase knowledge about stroke is to target a younger generation. We have designed an educational intervention that targets middle school students and their parents in an effort to improve stroke awareness.

The Kids Identifying and Defeating Stroke (KIDS) project is funded by the National Institutes of Health. It is an ongoing school-based health promotion project in Corpus Christi, a biethnic community in south Texas. The primary aims are: 1) to increase stroke symptom knowledge; and 2) to increase behavioral intent to immediately activate EMS among Mexican American and non-Hispanic White middle school children and their parents. Secondly, it aims to increase behavioral action, ie, immediate activation of EMS upon recognition of stroke symptoms. This project offers an initial opportunity to disseminate stroke knowledge and influence behavior in a representative biethnic community. If successful, it may serve as a model to provide stroke education to a new generation. Here, we describe the design of and preliminary data from KIDS.

## METHODS

### Overall Design

Corpus Christi has 12 middle schools, 6 of which were randomly selected for the KIDS project. They were randomized 1:1 to the intervention or control group. A baseline test (pre-test) was administered to all 6th graders and their parents at the start of the

project in all schools. The identical test (posttest) will be administered to the same students and parents at two subsequent time points. The intervention schools were assigned to the stroke educational program, while the control schools were given the standard regularly planned science curriculum. Students are considered to have received the intervention if they completed a pretest and attended at least one intervention class. Similarly, parents are considered to have received the intervention if they completed a pretest and their child attended at least one intervention class. Students who did not return a pretest were also considered to have received the intervention if they attended one intervention class and had a parent who returned a pretest.

The educational intervention was designed by a health education professor in conjunction with stroke neurology physicians and nurses and is based on social cognitive theory (SCT). The curriculum was delivered by an educator and a stroke neurologist. The educator, stroke neurologist, and health education professor are blinded to the test questions to ensure that the outcome assessments accurately measure the impact of the intervention on knowledge and behavioral intent without investigator bias. The KIDS project uses the students to disseminate stroke education to their parents in the form of homework assignments that the students complete with their parents. This method uses the strong family ties that characterize many Mexican American families.

The impact of KIDS on stroke is ascertained through the Brain Attack Surveillance in Corpus Christi (BASIC) project, the details of which have been described elsewhere.<sup>13</sup> Briefly, BASIC is a population-based surveillance study that identifies all cases of stroke within Corpus Christi. The BASIC project enables the determination of the effect of the KIDS educational intervention on EMS use for stroke. The KIDS project began in 2002. All intervention

activities were completed in late 2005. Follow-up data collection will be completed in 2007.

### Study Setting

The KIDS project takes place in Nueces County, Texas. The total population of Nueces County was 313,645 in 2000, and  $\approx 86\%$  of this county's population lived in the city of Corpus Christi. Of the total population, 58% are of Hispanic origin, 36% are non-Hispanic White, and 7% are African American or of other races.<sup>17</sup> The population of Nueces County closely reflects the income and educational level of the broader population of Mexican Americans in Texas. Six acute-care hospitals serve the area. The surrounding counties are sparsely populated, and the closest urban centers, Houston and San Antonio, are  $\sim 150$  miles away. As such, referral outside the county for AIS treatment is rare. This geographic structure sets up a highly self-contained environment in which precise population-based data can be obtained.

The Mexican American community in Corpus Christi is not an immigrant population. In fact, Mexican Americans have resided in the community longer, on average, than non-Hispanic Whites.<sup>14</sup> The Mexican Americans in this community are predominantly second- and third-generation United States citizens, which facilitates successful followup of the intervention and control cohorts throughout the study.

### Study Population

The targeted population consists of middle school children in sixth grade and their parents or guardians. Students who complete the pretest are asked to identify two adults in their community with whom they are closest to participate in the follow-up tests and homework assignments. The intervention continues throughout the three years of middle school, sixth through eighth grade.

### The Corpus Christi School District

The Corpus Christi Independent School District (CCISD) was established in 1909. In the 2000–2001 school year, 19,296 students were enrolled, and 8827 were in middle school. The attendance rate is 95%.

### Outcome Measures

The primary outcome measures are: 1) the percentage of students who recognize symptoms of stroke; 2) the percentage of students who express the intent to activate EMS upon recognition of these findings; 3) the percentage of parents who recognize symptoms of stroke; and 4) the percentage of parents who express the intent to activate EMS upon recognition of these findings. Secondly, BASIC makes it feasible to capture the effects of KIDS on the behavioral action of calling 911 when a stroke is recognized. When a stroke is captured through BASIC, the subject is asked how medical care was accessed and if a person connected to a CCISD student was involved in that activation. If a connection to CCISD is ascertained, further questions will be asked to determine if there is any association with KIDS participants.

### Measurement of Student and Parent Knowledge

Participating classes at the randomized schools complete a pretest at the beginning of the sixth grade. These students take the pretest home to ask two parents/guardians to complete it. The intervention follows shortly thereafter at the assigned schools. Posttest assessments aimed at evaluating the efficacy of the intervention occur at the end of the eighth grade. Posttests for parents are sent home with students who are asked to return the completed assignments to a designated school liaison. The posttest occurs at least three months from the last curriculum session to ensure that test performance is not

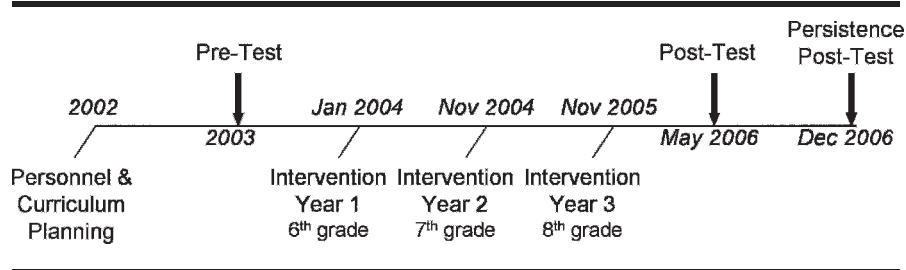


Fig 1. KIDS timeline

related to short-term memory performance. Six months later, another post-test is performed to assess persistence (persistence posttest) (Figure 1).

### Human Subjects

Institutional review board approval was received from the University of Texas Medical School at Houston and the University of Michigan. In addition, the program was reviewed and approved by the CCISD superintendent, principals, and a parent group. All identifying information is removed, and subjects are identified by case numbers.

### Informed Consent

A passive consent procedure was used.<sup>18</sup> A letter was sent to parents informing them of the project approximately four weeks in advance. The letter described the project and provided a contact person and telephone number for further information or questions. Parents were asked to return the enclosed card if they did not wish their child to participate.

### Sample Size and Power

Baseline levels of stroke knowledge and behavioral intent were estimated from a professional community-based stroke survey in Corpus Christi.<sup>14</sup> The KIDS project seeks to increase symptom recognition from the baseline of <25% to 50%, behavioral intent from <63% to 80%, and treatment knowledge from <60% to 80% among the adult participants.<sup>14</sup> Corrections for multiple comparisons were prespecified with a standard Bonferonni approximation for computing the total type I error

expended. Assuming a total sample of 30 students per school in the total cohort (assuming 40% follow-up loss rate from a sample size of 50 students per school) produces at least 85% power for an examination of each of the research questions in the Mexican American cohort and at least 71% power for an evaluation of these questions in the total cohort. Enrollment of at least 216 adults is needed to show a significant change in knowledge and behavioral intent among the parents.

## CURRICULUM

### Social Cognitive Theory

Social cognitive theory (SCT) is recognized as one of the most frequently used health behavior theories for designing educational interventions targeted toward children.<sup>18</sup> This theory recognizes the interaction of personal, behavioral, and environmental factors in determining human action.<sup>19</sup> The reciprocal nature of these three determinants makes it possible to target interventions toward each or all determinants in order to affect human action.

The major objectives of the KIDS curriculum are to increase stroke knowledge and behavioral intent to activate EMS when stroke is recognized. Knowledge of stroke symptoms is necessary, but not sufficient, to motivate people to call 911 for suspected stroke. Social cognitive theory (SCT) suggests that increasing self-efficacy, or a belief that one is capable of identifying symptoms of stroke and calling 911, even under difficult circumstances, will increase the

likelihood that such action will be taken. Additionally, SCT indicates that improving outcome expectations, or the belief that calling 911 will lead to positive outcomes, will also increase the likelihood that the recommended behavior will be followed. Social cognitive theory (SCT) was used to guide the development of a middle school curriculum that would achieve the major objectives of the KIDS Project by changing three SCT personal factors: 1) knowledge of stroke symptoms; 2) self-efficacy for activating EMS for suspected stroke; and 3) positive outcome expectations related to acute stroke treatment. We planned to improve our students' self-efficacy and outcome expectations by providing them with roleplay (skill mastery) opportunities related to specific examples of stroke scenarios and the desired action (calling 911). Acute treatment (rt-PA) is highlighted along with positive outcomes. Vicarious learning through modeling, verbal persuasion, and skills to reduce negative emotional states are also incorporated into the lessons to increase self-efficacy and strengthen the likelihood of students activating 911 in response to stroke. Additionally, environmental influences that facilitate the desired action are emphasized, while environmental factors that might hamper or delay the desired action are directly addressed and myths dispelled.

### Curriculum Development

Several needs assessment strategies were used as a foundation for curriculum development. A professional community-based stroke survey in Corpus Christi demonstrated a lack of awareness of stroke symptoms and therapy.<sup>14</sup> This knowledge barrier was present in both Mexican Americans and non-Hispanic Whites, however, it was more pronounced among Mexican Americans. Thus, our culturally sensitive curriculum was designed to address the needs of both groups.

In order to facilitate development of a culturally sensitive curriculum, separate focus groups consisting of students, teachers, and parents, unassociated with the randomization schools, were assembled. Information provided by the focus groups included confirmation of the knowledge and behavioral intent barriers regarding AIS. The focus groups also brought attention to the large variability in the level of parental involvement with students' school activities and the difficulties involved in transmitting information to and from parents through students.

On the basis of our needs assessment data and SCT, a multimedia curriculum of four hours of class time per year plus homework assignments was designed. Each curriculum lesson has specific learning objectives.

### Personnel

Three project members travel to each intervention school: an educator, a stroke neurologist, and a data manager. The educator and stroke neurologist present the intervention. The data manager ensures that all students and assignments are accounted for.

### Curriculum Delivery

The curriculum is provided in four, one-hour classes per week during the sixth, seventh, and eighth grades. An interactive teaching approach is used that includes multimedia resources, art projects, roleplays, and educational games. The lessons are delivered to the students with the expressed intent that they are to teach their parents the same material at home as part of the homework assignment.

In year one, the intervention was taught during the regularly scheduled science class. In order to follow the same students over the next two years, students leave regularly scheduled classes (but not core classes) to attend the intervention class in years 2 and 3.

Each intervention class is followed by a homework assignment. The in-

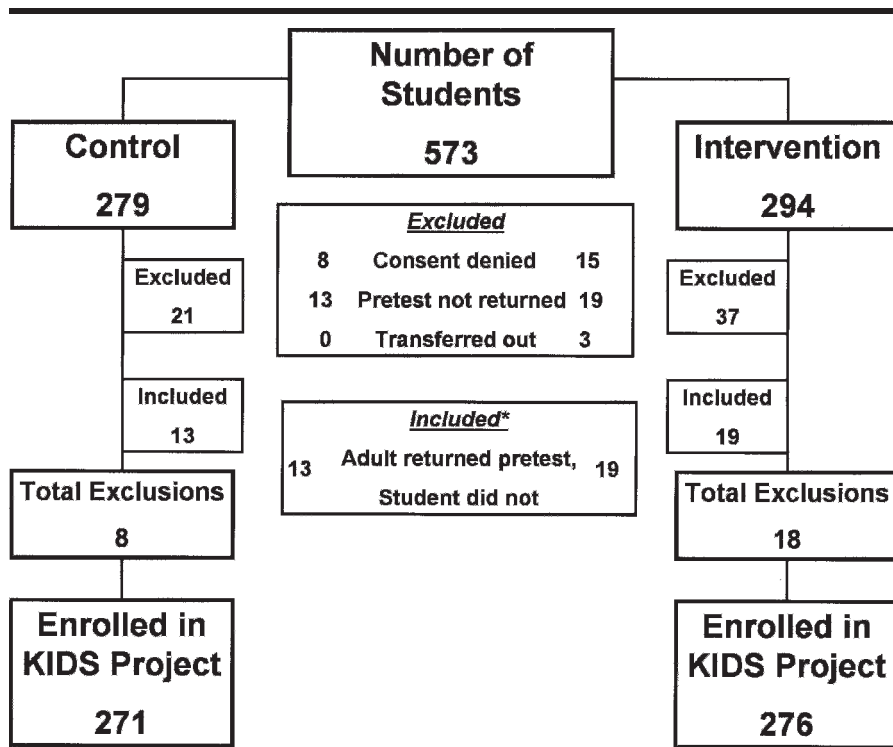


Fig 2. Student participation

\*Since adults returned pre-tests, the associated student continued to be followed in the KIDS Project

tervention message provided to students at school is carried home to parents by the children through each homework assignment. This method reinforces the lesson in the students and incorporates the family unit in the education about stroke. Homework assignments require participation and a signature from parents, thus optimizing the likelihood of parental involvement and teaching. All homework assignments are sent home in English and Spanish. If the parents are illiterate, the teaching provided by the student and pictorial material facilitates learning.

### DATA ANALYSIS

Frequencies and percentages of student and parent participation were calculated. Means and proportions were calculated for demographic variables by intervention group. The analysis was performed with SAS software 9.1.

## RESULTS

### Participation

All six schools randomized agreed to participate (three intervention, three control). All schools originally randomized remain in the program to date. A total of 23 students (8 control, 15 intervention) declined participation. In year 1, a total of 547 students in the sixth grade (271 control, 276 intervention) were enrolled in the KIDS Project (Figure 2). Among the adults, four declined participation (three control, one intervention). In year 1, a total of 454 adults (203 control, 251 intervention) were enrolled in the KIDS Project (Figure 3). Student and parent demographics are found in Tables 1 and 2, respectively.

In the intervention schools, pretests have been completed by 257 sixth graders and 251 adults. In the control schools, pretests have been completed by 258 sixth graders and 203 adults. Our attrition rate in student enrollment

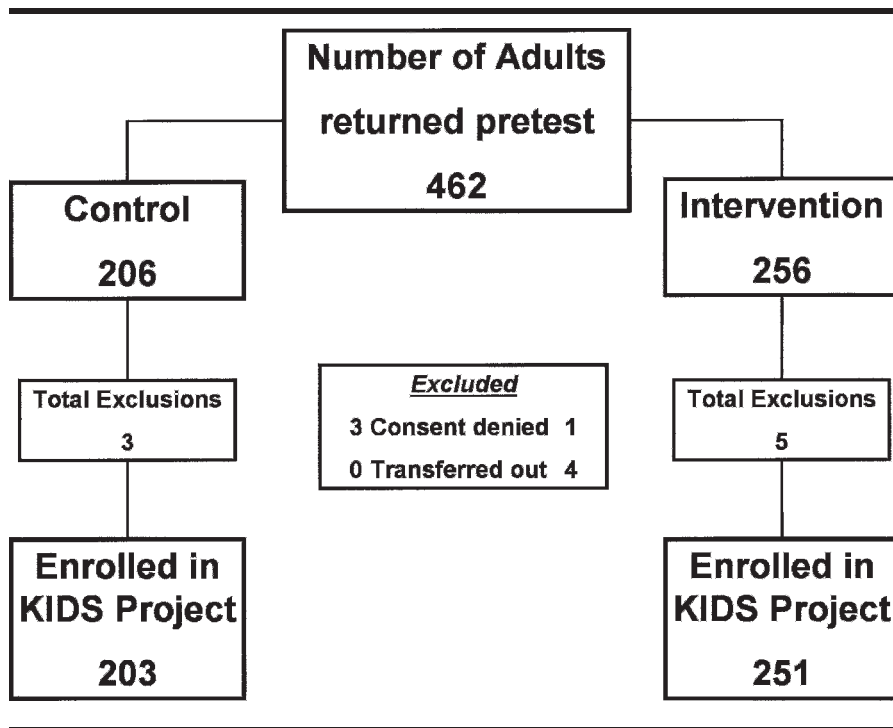


Fig 3. Adult participation

Table 1. Student demographics

	Control (%)	Intervention (%)
<i>n</i>	271 (49.5%)	276 (50.5%)
Male	110 (40.6)	145 (52.5%)
Race by ethnicity		
Hispanic	232 (85.6%)	205 (74.3%)
Non-Hispanic	22 (8.1%)	61 (22.1)
Incomplete/missing*	17 (6.3%)	10 (3.6%)

\* Data form was either left blank or form not returned by student.

Table 2. Adult demographics

	Control (%)	Intervention (%)
<i>N</i>	203 (44.7%)	251 (55.3%)
Male	78 (38.4%)	93 (37.1%)
Age (years)	36.2	36.8
Race by ethnicity		
Hispanic	181 (89.2%)	171 (68.1%)
Non-Hispanic	21 (10.3%)	68 (27.1%)
Incomplete/missing*	1 (0.5%)	12 (4.8%)

\* Data form was either left blank or form not returned by parent.

between years 1 and 2 was 23.2% (Table 3) and was largely due to transfers out of the intervention schools and difficulties involved in getting students from other assigned classes to the intervention classes. The homework return rate (number of students who returned one or more assignments) in year 1 was 41% (Table 4).

## DISCUSSION

We describe the design and baseline data of a school-based stroke education intervention that targets middle school students and their parents/guardians. The intervention is designed to improve recognition of stroke symptoms and increase behavioral intent to activate EMS when AIS is recognized. Previous efforts to increase public awareness and decrease time to hospital presentation for AIS have not resulted in faster arrival times, but have resulted in the increased use of intravenous rt-PA.<sup>20</sup> To our knowledge, this is the first description of an educational initiative for middle school students and their parents in an effort to increase the treatment rate of AIS. Our intervention has a particular focus on the Mexican American community as Mexican Americans have a substantially greater ischemic stroke incidence compared with non-Hispanic Whites.<sup>13</sup> However, the knowledge barrier regarding stroke was present in both Mexican Americans and non-Hispanic Whites. Thus, our curriculum was designed to address the needs of both groups. While target communities may differ in ethnicity, the general message about stroke remains equally important among all ethnic groups.

Our experience thus far with KIDS demonstrates that this educational initiative is quite feasible. The Corpus Christi community and CCISD have been receptive to the project and instrumental in facilitating delivery of the curriculum. Targeting middle school children offers several advantages. Stu-

**Table 3. Attendance**

Attended:	Year 1	Year 2
4 classes	222	121
3 classes	48	47
2 classes	2	29
1 class	4	15
≥1 class	276	212

dents allocated to the intervention and control groups are not likely to cross over as grades are ascended. Unlike grade school students, middle school students can better comprehend the seriousness of medical emergencies and health issues. This age group is also learning about external influences and developing self-efficacy, both of which are key concepts in SCT, the basis of the KIDS curriculum.

Our observations in the classroom suggest that this age group (11–13 years) understands our general message: stroke is an emergency with possible treatment if 911 is activated. The students had difficulty with certain complicated concepts such as functional neuroanatomy, but overall, they demonstrated a remarkable ability to integrate the information at a level that, at times, far exceeded our expectations. This age group is a challenging group to engage and required a fair amount of creativity to keep the group interested. The use of computer-based activities (eg, <http://www.med.umich.edu/stroke/kids/index.html>) or activities that required the students to draw or be creative appeared to capture their interest and attention best. For reinforcement of concepts, a game format

seemed to be most engaging of the students’ attention. Follow-up testing will demonstrate whether these efforts translate to a measurable and persistent improvement in stroke knowledge and behavioral intent to activate 911.

Limitations to the KIDS Project are being identified. Our attrition rate of 23.2% is disappointing but not unexpected and is consistent with findings from other school-based intervention programs.<sup>21</sup> Our attrition rate was largely due to transfers out of the intervention school. However, some students were not allowed to participate during the second year because their teachers were not aware of or did not recall the purpose of our yearly intervention. We found that reminders, flyers, and thank-you notes worked well to remedy this. The use of an administrative liaison who reminded the teachers of the intervention, helped locate students, and assisted with collection of homework was also helpful. In order to minimize bias, a conservative analysis is planned. This analysis involves giving any student who moved out of the school, or were otherwise lost to followup between the pretest and posttests, the same score on the posttest as they received on the pretest. Homework

assignments were designed to deliver our educational message to the parents. In addition to our homework return rate of 41%, some students appeared to have signed the assignments for their parents. Thus, we have no way of determining the true number of adults who reviewed the material. We cannot say whether completion of the assignments is essential for improving stroke knowledge and behavioral intent. If the intervention does not have an effect on parents’ responses, mechanisms other than homework assignments should be explored to effectively diffuse the curriculum to parents.

This pilot project, as it nears its completion, remains a work in progress. Some observations that might strengthen our curriculum and its delivery include feedback from both teachers and students regarding successful and unsuccessful features of the project. In addition, mechanisms to minimize the number of students lost to followup should be explored further.

The KIDS project explores one possible way to improve awareness of stroke symptoms and treatment by targeting a younger generation. Incorporation of our stroke education curriculum was feasible with the assistance of CCISD. The results of our intervention are pending. If successful, this project may be a model to provide stroke education and, ultimately, to decrease the burden of stroke by increasing the number of patients with AIS who present within the time window for rt-PA treatment.

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**Table 4. Homework return rate**

Number of Students Who Returned:	Year 1	%
3 assignments	75/276*	27.17
2 assignments	17/276	6.16
1 assignment	21/276	7.61
0 assignments	163/276	59.06
≥1 assignment	113/276	40.94

\* The number of participating students in the intervention group was 276.

## SCHOOL-BASED STROKE AWARENESS INTERVENTION - *Gonzales et al*

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