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School-Associated Child Deaths in Kansas

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Abstract

Background. The purpose of this investigation was to review each school-associated child death in Kansas. No statewide studies of school-associated child death, regardless of cause, were found in the literature. This report details all-cause school-associated mortality in Kansas children during a 13-year period.

Methods: Files for all school-associated child deaths (ages birth through 17) were compiled for the calendar years 1994 through 2006. Data files were provided by the Kansas State Child Death Review Board. Annual census data from the Kansas State Department of Education were obtained to determine annual student death rates. Data extracted from each file included: gender, race, year of death, age at death, manner of death, cause of death, whether an autopsy was performed, and whether the death was preventable.

Results: A total of 26 school-associated deaths occurred in Kansas children over the study period. The school-associated death rate averaged 0.402 per 100,000 students per year. The median number of student deaths per academic school year was two. Thirty-one percent of all school-associated deaths were sudden cardiac deaths. Sixty-five percent of all deaths occurred during or shortly after participating in a physical activity or in sports.

Conclusions: School-associated child deaths are rare events. However, the majority of deaths were preventable through better parental or school supervision, better communication with the school about student health issues, and safety education, especially related to sports activities and transportation. *KJM 2009; 2(3):52-61.*

Introduction

Most Americans learn of child deaths at school from media reports. Violent deaths that occur at schools, such as Columbine High School in Colorado or the Amish school in Pennsylvania, particularly receive extensive media coverage. Yet, these are rare events.[1,2] The annual incidence of violent death at school in the US is .068 per 100,000 students.[1] Few studies have analyzed school-associated child deaths systematically in a defined population. This approach is necessary to put public concern about school-associated deaths into perspective and to develop prevention strategies.

Approximately 20% of the combined US adult and child population are in schools on any given day.[3] The causes of school-associated child deaths are varied. Many are sports or activity related. For example, sudden and unexpected deaths of adolescents in Allegheny County, Pennsylvania between 1972 and 1980 were identified from state death certificates.[4] Only 11.3% occurred in the school environment. Half were exertion-related, most during school sports. All exertion-related deaths were male; all non-exertion deaths were female. Most deaths occurring in the school setting were caused by disorders with nonspecific

or absent premonitory symptoms and their preventability was uncertain. The primary identifiable causes were cardiovascular and spontaneous intracranial hemorrhage.

Similarly, approximately 60-80 cases of childhood sudden death occur under school supervision every year in Japan.[5] About 71% was sudden cardiac death. The incidence of sudden death among Japanese school children increased with age. Cardiac sudden death often was related to physical exercise. Boys were more prone to sudden death than girls.

Most sudden deaths in young competitive athletes are due to structural cardiovascular abnormalities with hypertrophic cardiomyopathy being the most common.[6-9] The majority of sudden deaths were associated with four sports: football, basketball, track, and soccer.[7] The highest number of deaths occurred in football.[8] Because of the improvement in protective gear and rule changes, the main concern in football deaths in recent years was the increase in heatstroke and heart-related sudden death.[9]

National evaluation of non-traumatic sports deaths in high school athletes participating in 17 sports found 126 deaths in a 10-year period (1983-1993).[8] Death rates were more than five times greater in male than female athletes. Deaths occurred in many sports including football, track, wrestling, baseball, soccer, cross country, swimming, and tennis. Most deaths were due to cardiovascular abnormalities. Of the non-cardiac causes of death, exertional hyperthermia was the most common. The majority of deaths was preventable. A complete medical history should identify approximately 75% of problems that will affect initial athletic participation.[7]

All Minnesota high school records for 12 years (1985-1997) were reviewed in a study of sudden cardiac death.[10] Three cardiovascular deaths occurred. Each death occurred suddenly during exertion; two in cross-country or track and one in basketball. None had a history of cardiac symptoms. Further screening would have had little impact on the outcome. All had the standard pre-participation history and physical examination. No other deaths occurred related to trauma or other sports-related causes. The prevalence of sudden cardiac death for high school athletes in Minnesota was calculated at 1:200,000.

National asthma deaths were investigated over 14 years (1990-2003) including those that occurred at school, enroute to or from school, or enroute to or attending a school-sponsored event.[11] Thirty-eight asthma deaths were documented with an upward trend over time. Physical activity preceded the episode in over 40% of the deaths. Most occurred during school-sponsored sporting events. About one-third of the cases reported delays in the students receiving emergency asthma medication at the time of the fatal attack.

A Japanese study reported on 76 victims of school-associated sudden death in whom obvious causative diseases were not detected prior to death.[12] Deaths were associated with vigorous activities, particularly running, and influenced by meteorological conditions. For example, dryness and high pressure in spring were related to deaths in children running. Dry and cloudy weather was related to deaths in children participating in competitive sports.

Over an eight-year period (1987-1995), 22 school-associated child deaths related to school buses were reported in Australia.[13] Over three-fourths of the deaths resulted from children being hit crossing the road after leaving the bus. Further, four school-associated fatalities related to hanging from cloth towel dispensers were reported in Canada.[14] These incidents were likely the result of thrill seeking or risk taking behavior during a “choking/blackout game”.

The purpose of this investigation was to review each school-associated child death in Kansas using the State Child Death Review Board's (SCDRB) database. The SCDRB was created in 1992 as a multi-disciplinary, multi-agency panel to review child deaths in Kansas.[15] The SCDRB has the statutory obligation to review the death of every child who was a Kansas resident or died in the State of Kansas.

No statewide studies of school-associated child death, regardless of cause, were found in the literature. This report details all-cause school-associated mortality in Kansas children during a 13-year period including 12 academic years (fall semester of each year through the following summer).

Methods

This study is a descriptive, retrospective database review and reports a case series of school-associated child deaths. Files for all school-associated child deaths (ages birth through 17) were compiled for the calendar years 1994 through 2006. Data files were provided by the Kansas State Child Death Review Board. The age range represented children's ages under the SCDRB's authority for review. The time frame represented all years with completed data.

Cases were identified through two queries of the database. The first query documented all deaths where the event location was identified as "school". The second search queried all text fields for the word "school" to identify school-associated deaths that did not occur on school grounds. The results of the second query were reviewed individually by one investigator to determine inclusion/exclusion criteria. Events that were questionable (e.g., deaths of children going to or from school) were resolved by consensus of the authors.

A school-associated death was defined as a fatal incident or an incident leading to fatality that occurred on school grounds or during a school activity. Any event that occurred on school grounds regardless whether school was in session was included. Events that occurred at any school-sponsored activity were captured, including deaths in children riding on, going to, or waiting for a school bus. However, deaths of children going to school or returning home after school in a private vehicle were excluded by this definition.

Data extracted from each file included: gender, race, year of death, age at death, manner of death, cause of death, whether an autopsy was performed, and whether the death was preventable. If the "preventable" field was not completed by the State Child Death Review Board, the authors made the determination by consensus (Dr. Johnston and Dr. Melhorn are members of the SCDRB).

Annual census data from the Kansas Department of Education (DOE) were obtained to determine annual student death rates. The total census from all schools within the state was used to represent the total number of students in Kansas. This census included kindergarten through twelfth grade and all special programs. The DOE data were not broken down by age, therefore, some students were included in the census that were 18 years of age or older. Since most students in Kansas typically begin their senior year of high school at age 17, these data were considered as an acceptable census denominator for study purposes.

The academic school years 1993-1994 and 2006-2007 were excluded from this analysis, because complete SCDRB data were not available. Thus, academic school years from 1994-1995 through 2005-2006 were analyzed. For the purposes of this study, the school year began in August and continued through July. No other statistical analyses were calculated for this descriptive study.

Results

A total of 26 school-associated deaths occurred in Kansas children over the study period. Table 1 details the characteristics of the deaths. Table 2 provides a brief description of each death. Twenty-five of the deaths were students ranging in age from 5 to 17 (median age was 13). One death was an infant visitor to a school who died in an unusual accident where glass from a large picture frame fell on his head. Sixty-five percent (n=17) of the children was Caucasian, twenty-seven percent (n=7) was African-American, and eight percent (n=2) was Hispanic. Eighty-one percent (21 of 26) of the deaths were males. Thirty-one percent of all school-associated deaths (8 of 26) were sudden cardiac deaths attributable to hypertrophic cardiomyopathy (2), congenital heart disease (2), hypertrophic subaortic stenosis (1), coarctation of aorta (1), coronary artery aneurysm (1), or cardiac arrhythmia (1). Sixty-five percent (17 of 26) of the deaths occurred during or shortly after participating in a physical activity or in sports.

Table 1. Characteristics of school-associated deaths in Kansas.

Cause of Death	Number of School-Associated Deaths	Number (%) of Male Victims	Number (%) Related to Sports or Physical Activity	Number (%) Autopsy Completed
Sudden Cardiac Death	**8**	**5 (63)**	**8 (100)**	**6 (75)**
[With known congenital heart disease]	**2**	**1 (50)**	**2 (100)**	**1 (50)**
Head or Neck Trauma	**5**	**5 (100)**	**4 (80)**	**4 (80)**
Asthma	**2**	**2 (100)**	**2 (100)**	**0 (0)**
Homicide	**2**	**1 (50)**	**0 (0)**	**2 (100)**
Hyperthermia	**2**	**2 (100)**	**2 (100)**	**1 (50)**
Motor Vehicle Crash	**2**	**2 (100)**	**0 (0)**	**1 (50)**
Animal Attack	**1**	**1 (100)**	**0 (0)**	**0 (0)**
Asphyxia	**1**	**1 (100)**	**0 (0)**	**1 (100)**
Brain Tumor	**1**	**1 (100)**	**1 (100)**	**0 (0)**
Seizure Disorder	**1**	**0 (0)**	**0 (0)**	**1 (100)**
Train Accident	**1**	**1 (100)**	**0 (0)**	**0 (0)**

The school-associated student death rate was calculated at an average of 0.402 per 100,000 students per year (24 deaths over 12 academic school years; see Table 3). One student death that occurred during the academic school year 1993-1994 was excluded because data were collected by calendar year beginning in 1994. Thus, information from the 1993-1994 academic year was not complete. This calculation also excluded the infant (non-student) death.

Student deaths occurred during 11 of the 12 academic years. The annual school-associated student death rate for those years ranged from 0 to 1.2 per 100,000 students. The median number of student deaths per academic school year was two.

Twenty-one deaths over the thirteen years were reviewed, but excluded from analysis. Sixteen of the deaths occurred during a motor vehicle crash in a private vehicle before or after school. Two children

Table 2. Brief descriptions of school-associated child deaths in Kansas.

Cause of Death	Demographics	Description	Preventable
Animal attack	11 year old African-American male	Mauled by 3 dogs while waiting for school bus.	√
Asphyxia	15 year old African-American male	Aspirated on candy while in classroom.	√
Asthma	15 year old White male	Collapsed while playing basketball.	√
Asthma	14 year old White male	Collapsed after running two-mile race. Used inhaler during race.	√
Brain Tumor	9 year old White male	Became unresponsive playing on school swings	
Cardiac arrhythmia	13 year old White female	Collapsed while playing at summer basketball camp.	
Congenital coarctation of aorta	12 year old White male	Collapsed during basketball practice.	√
Congenital heart disease	11 year old White female	Collapsed after running race.	
Coronary artery aneurysm	6 year old White male	Collapsed while running on playground.	
Head trauma	17 year old White male	Injured during football game.	
Head trauma	7 month old White male	Struck by falling glass from large picture frame.	
Head trauma	15 year old White male	Struck head on floor while lifting weights.	√
Head trauma	17 year old African-American male	Struck head on ground while pole vaulting.	√
Homicide	15 year old Hispanic male	Shot during drive-by shooting in school parking lot on the weekend.	√
Homicide	14 year old African-American female	Stabbed during altercation on school grounds.	√
Hyperthermia	17 year old African-American male	Collapsed during football practice.	√
Hyperthermia	15 year old White male	Collapsed during football practice.	√
Hypertrophic cardiomyopathy	13 year old White male	Collapsed while running on track.	

Table 2. (continued)

Hypertrophic cardiomyopathy	**14 year old Hispanic male**	**Collapsed while running.**	
Hypertrophic cardiomyopathy	**12 year old White female**	**Collapsed while running.**	
Hypertrophic subaortic stenosis	**9 year old White male**	**Collapsed while playing kickball.**	
Motor vehicle crash	**5 year old African-American male**	**Struck by car while crossing street to board school bus.**	√
Motor vehicle crash	**6 year old African-American male**	**Died when school bus was struck by a semi-trailer truck.**	√
Neck Trauma	**12 year old White male**	**Ran into wooden sign while playing football.**	√
Seizure disorder	**11 year old White female**	**Complained of dizziness and passed out in school hallway.**	√
Train accident	**15 year old White male**	**Unsupervised on railroad tracks during field trip and struck by train. Child was deaf.**	√

Table 3. Annual school-associated student death rates per 100,000 students.

School Year	# of School Deaths	State School Population	School Deaths / 100,000 Students
1994-1995	0	490,966	0.000
1995-1996	2	493,552	0.405
1996-1997	3	496,863	0.604
1997-1998	2	499,674	0.400
1998-1999	6	500,462	1.200
1999-2000	1	501,064	0.199
2000-2001	2	501,064	0.399
2001-2002	1	500,562	0.200
2002-2003	2	499,458	0.400
2003-2004	3	499,189	0.601
2004-2005	1	497,514	0.201
2005-2006	1	478,029	0.209

were killed in accidents while riding their bicycles to or from school. One child was run over by a car while crossing a highway on the way to school. None of these events occurred on school grounds. One child was shot in a bank parking lot after school hours. This incident began with an argument at school that was managed by school personnel. Later, the event escalated into a homicide off school grounds. One child became ill at school, went home, then later transferred to the hospital and died.

Although each death had some association with "school", none was determined to meet the criteria for a school-associated death.

Discussion

School-associated child deaths are rare events in Kansas. While any child death is tragic, the actual number of school deaths is small. During the 13 years reviewed, two school-associated deaths occurred on average each year in a population of approximately 500,000 students statewide. In comparison, approximately 500 child deaths are reviewed each year by the SCDRB.[15] Further, child deaths at Kansas schools are much less than adult fatal injuries in the Kansas workplace. Kansas has a 13-year average of 56.2 workplace fatalities annually.[16]

As in previous studies, sudden cardiac death was notable in our study. All of these deaths were exertion-related. All children of middle or high school ages had pre-participation sports physicals. Although two children had previous surgery for congenital heart disease, the majority of these heart conditions was unknown before the event and judged not preventable by the SCDRB. In one case where a congenital heart problem was known, reasonable precautions had been taken. However, when cardiac disease is known, precautions must be taken before the child engages in physical activity. Shared responsibility by the parents, school personnel, and physicians is recommended to prevent such tragedies.

In our study, two exertion-related deaths were due to asthma. Both events were witnessed and each received appropriate resuscitation attempts. Yet, appropriate monitoring of asthma in children and treatment of exacerbations make such deaths preventable. Again, shared responsibility is the key to prevention.

A consensus statement by 17 organizations, including the American Academy of Pediatrics and the American Academy of Family Physicians, made specific recommendations for the appropriate medical care of secondary school-age athletes.[17] These recommend-ations included more than emergency care and event coverage. They included ongoing daily athletic health care and appropriate education and professional development for providers. This type of national recognition has aided in the reduction of sports-related deaths in recent years. Improvements have been made in protective gear and rule changes. Also, improved medical care at sporting events with a team physician and/or emergency personnel attending events is common practice in Kansas. These precautions should decrease sports-related deaths over time. Further precautions are likely as research in sports medicine provides better information and new protective gear is developed.

No school-associated homicides have occurred in Kansas since 1995. Contrary to public perception, violent crime and homicides in schools has declined dramatically since 1994.[18] Youth were over 50 times more likely to be murdered and were over 150 times more likely to commit suicide when they were away from school than at school.[19]

The Kansas data revealed a number of motor vehicle deaths involving students going to and from school. Over the study period, 19 motor vehicle-related deaths involved children driving a car, riding as a passenger in a car, riding a bike, or walking across a highway. Although these deaths were determined not to be school associated by definition, the total number approximates school deaths. Students should be educated about safety issues going to and returning from school. Adolescent automobile acci-dents occur more frequently on school days, particularly right before and after school.[20] The cluster of adolescents in one place at

one time, often in a rush, enhances the need for safety.

Interestingly, the vast majority of deaths, other than sudden cardiac deaths, was preventable. These cases included those with previous medical management (asthma and seizure disorder), easily provided prevention techniques (hyperthermia), lack of adequate adult supervision (animal attack, asphyxia, and train accident), and inadequate driving safety practices (motor vehicle crashes). No simple resolution exists for all child deaths. Some events require better parental supervision; some require better school supervision. Further, some require better community awareness. Shared responsibility to protect children is recommended.

A few general recommendations for prevention are suggested:

1. Parents should notify school personnel about chronic medical problems, especially those that require medication or restrict activities. Proper authorization should be given to administer medications as appropriate and supervise physical activities.
2. School personnel should be prepared for medical emergencies. Such preparation includes awareness of children that require medication and restriction of activities. Medication must be available in times of emergency and a plan should be in place to obtain and provide it.
3. Physicians should advise parents, repeatedly if necessary, about their children's health care needs and how they impact their daily lives. Children spend a considerable portion of their wakeful moments in school away from their parents. Therefore, physicians can assist parents to understand how best to protect their children.
4. Organized school activities require adequate adult supervision. If school personnel cannot provide the necessary supervision, assistance from parents or adult volunteers is required. Prevention requires awareness of potential problems before they occur (e.g., spotters for weight lifting or frequent water breaks).
5. Community education should focus on how to protect children, especially immediately before and after school. This education should not be restricted to speed limits in school zones, but a general awareness of children walking, riding bicycles, or driving during these hours. "Safe Routes to School" is a beneficial federal program designed for communities to increase a child's ability to walk and bicycle safely to school.[21]
6. Students should be educated, repeatedly, about safety techniques, particularly for physical activities and sports. Adult supervision for practices is important. Appropriate protective gear always should be provided and used.

This study has one primary limitation. Although it is a population-based study over several years, data were limited to only one state. Kansas is a largely rural state with two major population centers. Data from larger, more urban states may be different.

In summary, the actual number of school-associated deaths in Kansas is small. Yet, the potential exists for a reduction. Shared responsibility for the safety of children between parents, schools, and community is necessary. Often simple solutions, such as adequate supervision or enhanced diligence, can prevent a tragedy.

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Perspectives of Health Care Issues in Rural Kansas Communities: An Analysis of Strengths, Weaknesses, Opportunities, and Threats

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Abstract

Background. The purpose of this study was to develop a greater understanding of healthcare issues in rural Kansas communities.

Methods. Ten focus groups were conducted with rural community leaders.

Results. Community strengths included quality of life, community involvement, healthcare facilities, agency collaboration, and commitment to healthcare worker recruitment. Weaknesses were language barriers, aging population, healthcare workforce availability, physician and spouse recruitment, access to medical, dental and mental healthcare, poor oral hygiene, lack of transportation, and data collection issues. Community members identified several opportunities for rural Kansas, including the high quality of life, agency collaborations, public health education, and distance education. However, external threats affected communities, including economic decline, outmigration, poor farming industry, civic disinterest, growing rates of poverty, uninsured and vulnerable populations, high costs of health care, and funding shortfalls for school-based programs.

Conclusion. Efforts should be directed towards healthcare professional recruitment, support for vulnerable populations, public health education programs, and inter-agency collaborations.

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Introduction

The Census Bureau classifies 25% of the US population as rural.[1] Rural populations are declining because of lack of local jobs and the allure of big cities.[2,3] In addition, rural communities have greater health issues, such as higher prevalence of obesity,[4] higher rates of cancer, heart disease, diabetes and injury-related deaths,[5] and higher prevalence of chronic conditions.[6] This may be due in part to insufficient healthcare resources, difficulties in accessing healthcare,[6] and physician shortages.[7-10]

These issues, identified as global in nature,[6] also have been identified in Kansas, a predominantly rural state. Kansas, the 15th largest state, covers 82,282 square miles.[11] Kansas has 99 local public health departments (LHDs) that provide services to 2.9 million residents in 105 counties, that are urban, rural, and frontier. There is wide variation in public health capacity across Kansas, and rural and frontier areas have difficulty maintaining healthcare resources.[12] Moreover, rural Kansans may travel by car up to three hours to access healthcare at a large medical facility,[12] therefore, concerns identified by Kansas community focus groups have legitimate and supported bases.

The purpose of this focus group study was to identify community perceptions of

healthcare needs of rural Kansans and to understand better the perceived strengths and weaknesses of those communities.

Methods

Sampling and recruitment procedure. Key community stakeholders[13] from six rural regions of Kansas were identified as potential participants by community chambers of commerce and health departments. Focus group locations included: Arkansas City, Atchison, Chanute, Emporia, Garden City, Hays, Hutchinson, Phillipsburg, Salina, and Ulysses. Participants were recruited from several community groups at each location and surrounding communities including: chambers of commerce, local elected and government officials, education administration, public health and community-based social services, local/regional hospitals and health care providers, local businesses, and faith-based groups. Participants were recruited via telephone, mail, and/or e-mail using contacts provided by key stakeholder organizations. The study purpose was explained and an invitation to participate was offered. Up to 15 volunteer participants were scheduled per focus group. A meal was provided in compensation for participation.

Focus group procedure. Focus group recruitment, facilitation, and analysis followed the standards offered by Debus.[14] Institutional Review Board approval was obtained. Demographic data was collected after informed consent was obtained and included age, gender, and profession/ employment sector. Focus group discussion questions included identification of both community and healthcare strengths and weaknesses. Interviews lasted approximately one and one-half hours each. Each focus group session was staffed and audio-taped by two trained moderators.

Data analysis procedure. Theme categorization was developed based on independent transcript review by two researchers. Inter-rater reliability was satisfactory (Kappa = 84.9).[15] Disparities in coding were addressed by mutual consensus.

The most common themes were organized based on a strength, weakness, opportunity, and threat (SWOT) analysis.[16,17] The purpose of a SWOT analysis is to identify opportunities for success in the context of threats, and determine where change is possible. Themes were categorized as internal (resources and experiences) or external (forces outside of the communities' control) and positive or negative (see Figure 1). Internal components were labeled as either strengths or weaknesses, while external components were labeled opportunities or threats.

Results

Participants. Seventy-six volunteers participated in ten focus groups with approximately eight participants per group. Participants were mostly female (68.4%) and aged 50 or older (71.1%). Thirty-eight percent of participants were in a health profession other than physicians, nurses, advanced practice practitioners and 38% were involved in business or another non-health related profession. Twenty-nine percent had lived at least 25 years in their current community.

Demographic characteristics of focus group locations are listed in Table 1 and compared to state and national percentages in race, language, poverty, and elderly rates. Half of the communities represented could be considered micropolitan,[18] where a moderately-sized community mixes with the rural area. Compared to state and national percentages:

- 80% experienced declining populations
- 90% have lower than median household incomes
- 30% have higher poverty rates

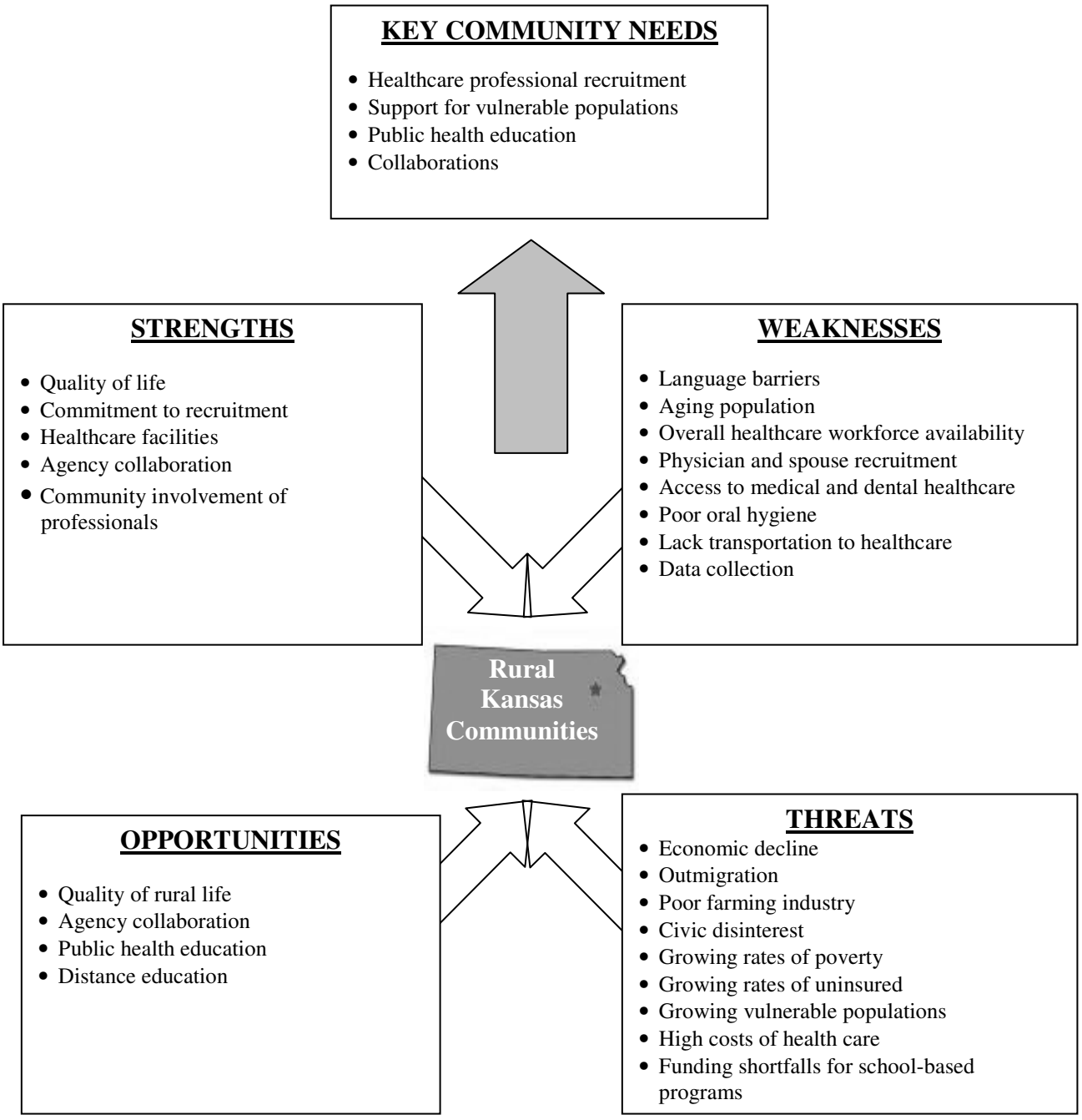

Figure 1. SWOT analysis of health care concerns in rural Kansas communities.

- 20% have more non-English speakers living at home
- 20% have higher populations of 65 year olds or older
- 50% have higher Hispanic populations

Local demographic statistics validate concerns commonly identified in focus group comments such as declining population rates, increasing poverty rates, and increasing vulnerable populations.

Perceived community strengths. Comments indicated strong work ethic, volunteerism, motivation, and a "willingness to help others" as the most significant contributors to community success. Quality of life characteristics, such as local fine arts and community events, a high quality educational system, and a "slower pace of life", also were considered strengths. Volunteerism, collaboration between community agencies, and a sense of "pulling together" were cited as key to community cohesion. Finally, ethnic diversity was reported as a positive factor.

Participant comments reflected pride in local healthcare facilities citing strong partnerships between regional hospitals, community health centers, and health departments. Most volunteers described community-wide efforts to recruit new health providers and to "get students interested in health careers". Efforts included providing incentives and scholarships to local nursing programs to entice students to practice in rural areas.

Perceived community weaknesses. Although an increasingly diverse population was cited as positive, it also was described as a challenge due to language barriers posed by non-English speaking residents (refer to Table 1 for language rates). There was a commonly held concern about the potential decline of community volunteers as most are from the aging retired population (refer to Table 1 for aging population comparison). Both the increasing age of the workforce as well as the increasing needs of senior citizens were considered future problems.

Participants expressed concerns about overall workforce availability in the health field and agreed it was difficult to recruit and retain physicians, particularly specialty physicians, despite facility improvements, state of the art diagnostic equipment, and competitive wage packages. Issues identified in physician turnover included retirement, physician burn out, and the community being used as a "stepping stone" to an advanced position in an urban setting.

A common challenge regarding spouse recruitment emerged. Physician spouses may seek community attributes that are non-existent in rural settings. Focus group participants reported that local strategies for health professions recruitment included financial, facility, and family incentives. However, rural communities found it difficult to compete with salaries provided in urban communities.

Access to dental care was mentioned by participants of several focus groups. Areas of concern included poor oral health habits and tooth decay among children, lack of pediatric dental providers as well as transportation barriers. One community reported trying to provide free general health education to clinic patients while they waited for medical appointments, however, patients were unresponsive. Low-income families without reliable transportation were reported to have been affected the most. In addition, scarce mental health resources were discussed. Collection of state and local health data was reported as a frustrating and daunting task.

Perceived community opportunities. Participants perceived their communities' strengths as their opportunities. The same components that make their community strong (strong work ethic, volunteerism, motivation, and a "willingness to help others") were identified as capacity building if properly nurtured and mobilized. Characteristics that epitomize the quality of rural life that small communities' offer should be the platform to attract new professionals. Volunteerism, collaboration, and involvement among community agencies and a sense of "pulling together" also were cited as key to community improvements.

Table 1. Demographic information about rural Kansas focus group locations.

	Population			2006 Income	2000 Race			Population Characteristics		
Region	2000	2007*	% Change	Median household income	White (%)	Hispanic (%)	Black (%)	2000 Non-English speaking (%)	1999 Below poverty (%)	2000 Age 65+ (%)
Arkansas City	11,963	**11,168**	**-6.5**	$31,000.00	85.3	4.5	4.5	---	---	---
Atchison	10,232	**10,078**	**-1.4**	$33,800.00	87.1	2.6	7.8	---	---	---
Chanute**	9,411	**8,854**	**-6.2**	$32,500.00	91.2	3.9	1.4	---	---	---
Emporia	26,760	**26,662**	**-1.1**	$33,400.00	71.1	21.5	3.0	19.8	17.9	11.0
Garden City**	28,451	**26,629**	**-6.0**	$41,000.00	49.8	43.9	1.5	39.6	14.3	8.1
Hays**	20,013	20,106	+0.2	$34,200.00	94.4	2.6	0.8	---	---	---
Hutchinson	40,787	40,668	+0.2	$35,400.00	85.4	7.7	4.3	5.5	12.7	16.9
Phillipsburg**	2,668	**2,372**	**-10.9**	$39,400.00	96.9	0.9	0.0	---	---	---
Salina	45,679	46,458	+1.1	$39,100.00	85.4	6.7	3.6	7.7	9.6	14.3
Ulysses**	5,960	**5,630**	**-5.9**	$46,300.00	60.7	37.5	0.0	---	---	---
State of Kansas	2,688,418	2,764,075	+1.1	$45,478.00	83.1	7.0	5.7	8.7	9.9	13.3
USA	281,421,906	301,621,157	+1.1	$50,233.00	69.1	12.5	12.3	17.9	12.4	12.4

Note. Dashes indicate the information was not available. The population, race, and income data are from American Fact Finder, US Census Bureau Web site (http://www.factfinder.census.gove/home/saff/main.html) and from city-data.com website (http://www.city-data.com/city/Kansas.html).

* Declining populations indicated in **bold type**.

** Cities are greater than a 100-mile distance from the nearest Kansas metropolitan (Kansas City or Wichita) health source (http://www.ksdot.org/burtransplan/dist_chrt.cgi).

The availability and provision of public health education by academic institutions is desired to promote positive physical, dental, and mental health habits. Participants campaigned for increased utilization of distance education venues to increase health education opportunities.

Perceived community threats. Participants stated their downtown businesses have experienced economic decline due to loss of retail business to larger cities. Lack of retail, fine dining, entertainment opportunities as well as low-paying jobs and higher local taxes were believed to be associated with the increasing outmigration of and inability to attract young employable adults. Other economic factors such as the decline of the farming industry and few jobs for youths also were reported as challenges. Although, participants listed collaboration as a strength, they reported that there is declining interest in community issues by local residents.

A consensus opinion across all groups was concern about the growing rates of poverty, single parent families, and free/ reduced lunches (refer to Table 1 for poverty comparisons). Several communities concurrently voiced concerns regarding increased demand for affordable health and dental care while reporting decreasing availability of healthcare services for un- and under-insured populations. Healthcare providers reported frustration with care seeking behaviors of low income patients such as appointment no shows, which could result in fewer physicians accepting public insurance patients. School-based health programs were reported as "vital" but threatened by funding shortfalls.

Participants from several communities voiced concerns about the high cost of health insurance. Premiums and prescription medications were reported as "prohibitive" for many people, leading un- and under-insured residents to delay or avoid preventive care due to rising costs. Urgent care had been discontinued by one community hospital due to the overwhelming demand for charity care. Many community-based businesses had reduced their health coverage, required higher deductibles or only hired part-time employees as an economic solution. Finally, participants suggested state insurance policies present a barrier because "Kansas doesn't allow self-insured pools of different types of businesses".

Discussion

Rural Kansans need support in healthcare recruitment, local continuing education for health-care providers, public health education, and solutions for problems working with vulnerable populations. Hart et al.[19] reported that multifaceted solutions are necessary. Furthermore, respondents expressed the desire for support "without having to write a grant".

Healthcare professional recruitment. Comments from our investigation reflected a strong rural community concern about healthcare workforce availability. Physician shortages combined with hospital closures create barriers for rural residents to access health care.[7] This concern addressed not only physician practitioners but also shortages in nursing, allied health, dental, and mental health providers, reflecting a critical need for healthcare professionals in general to practice in underserved areas.[6,8-10]

Crump et al.[20] recommended that medical educators should consider geography more carefully when designing solutions to the maldistribution of physicians and admit more medical students from rural areas. Longer rural rotations have been suggested to encourage physician retention.[21] Because rural medical practice is substantially different from urban, several authors recommended that rural medical practice[8,22] and general surgery[23] be

recognized as a distinct discipline. Charleston and Goodwin promoted preceptorship to improve recruitment and retention of rural mental health nurses.[24]

Telemedicine as an incentive has shown mixed results as a solution for recruiting and retaining physicians in rural communities. Sargeant et al.[25] reported that while telemedicine was used more frequently by most rural physicians, it actually was rated low in importance for retention. Some advocated that telemedicine may help address the healthcare needs of rural elderly,[26] however, others suggested that telemedicine may not be beneficial to older homecare patients.[26,27]

Focus group participants commented on the shortage of dental professionals previously reported.[7,28,29] Additional comments indicated that few dental providers will accept Medicaid patients. Krause et al.[30] suggested less restrictive supervision of dental hygienists might address the acute problems of poor oral health and access to dental care issues for rural states.

Vulnerable populations. Focus groups from each community voiced concerns about vulnerable populations including the elderly, the culturally diverse, and those with low income. The national rural population is older,[7] increases in rural populations are due to diverse ethnic immigration,[3] and the increasing number of poor people is the number one problem facing rural America.[31] Furthermore, residents of rural areas are more likely to be uninsured and for a longer period of time than urban.[7] Rural residents have been reported as less likely to be offered health benefits through their employment due to discrepancies between rural and urban insurance rates, thus policy changes may be necessary.[7,32]

Public health education. Nearly every community represented described the need to educate the general population about healthy lifestyle issues including nutrition, obesity, primary dental care, smoking, crisis management, lead levels, and general health. Solutions included home-based services and training as well as health education advocates. Geiger indicated that the provision of educational opportunities was the key to the development of health-related social change,[33] while Auchincloss and Hadden examined predictors of excess morbidity in rural areas and concluded that there was a need to improve education in disadvantaged places.[34]

Community collaboration. Collaboration between community agencies, social organizations, and businesses was reported as the largest contributor to community successes. However, those communities that reported successful programs did not believe services were sufficient to meet current and future needs. The World Health Organization and the Institute of Medicine suggested that strong and active community involvement contributes to successful health systems,[35,36] while Ryan-Nichols promoted partnerships with rural communities as part of strategies to promote rural health.[10]

Study limitations may include selection bias. As focus group participants only included people with sufficient time and interest, opinions noted here may not represent all rural citizens.

Conclusions

Problems facing rural communities in Kansas are similar to problems in rural communities from other states. According to Sarason[37], many social problems are intractable in nature. Issues such as poverty and lack of resources will never be solved in the sense that there is a single "solution" to be applied in every situation so that the "problem" no longer exists. Problems such as difficulty recruiting in rural areas, un- and under-insured persons, and limited funding

for healthcare initiatives are not new problems, and most likely will never be solved entirely. This is not to suggest that nothing should be done to address the issues and try to improve the outcomes. Sarason also suggests that we must consider the history of the problem and changes in both society and technology in our attempts to address these issues.[37] It is important for governments to stay apprised of current, evidence-based solutions, however, health reform policies must be tailored to local needs to account for variations across states.[7] Thus efforts should be directed towards healthcare professional recruitment, support for vulnerable populations, public health education programs, and inter-agency collaborations.

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Keywords: rural health, community healthcare, Kansas, focus groups

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Decompensation of Refsum Disease Caused by Ibuprofen Intake

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Introduction

Refsum disease (or heredopathia atactica polyneuritiformis) is an autosomal recessive disorder caused in most instances by mutations in the gene (*PhyH*) encoding the enzyme phytanoyl-CoA hydroxylase, located on chromosome 10pter-p11.2.[1,2] These mutations lead to the accumulation of phytanic acid in affected patients. The mainstay of treatment is a reduction in the dietary phytanic acid intake. The following case illustrates an aggressive progression of the disease in a patient who was compliant with the dietary restrictions.

Case Report

A 33-year-old white female, had a history of progressive loss of vision and hearing since the age of 20, cardiomyopathy, cardiac arrhythmias, gastroparesis, urge incontinence, decreased bone mass, bilateral hip replacement, multiple surgical interventions on the right ankle, and one surgical intervention on the right knee. At the age of 27, she was diagnosed with Refsum disease by associating the shortening of the 4th metatarsals bilaterally and the retinitis pigmentosa, along with a high phytanic acid level. She was started on the appropriate diet consisting of restrictions on green vegetables, meats from ruminating animals, and dairy products.

Since the age of 30, the patient was hospitalized four times at another facility for acute decompensation of her disease. During each hospitalization, she underwent five sessions of plasmapheresis. During her last hospitalization, her phytanic level was 105.5umol/L (reference range : $\leq$ 9.88). It decreased to zero after the completion of four sessions of plasmapheresis. She took ibuprofen 800 mg by mouth every eight hours during her hospital stay at the other facility.

The patient presented to the emergency department at our facility for acute exacerbation of her disease, including retro-orbital headaches, chest pain, nausea, vomiting, diarrhea, urinary incontinence, diffuse muscle aches, and weakness that had increased in intensity over two weeks. A detailed history revealed that she was compliant with her diet, but had a chronic ibuprofen intake for recurrent tension headaches. She was never told that ibuprofen is contraindicated in Refsum disease. The patient improved significantly after five sessions of plasmapheresis and discontinuation of ibuprofen.

Discussion

Branched-chain fatty acids are common in the human diet and related structures are common and occur in some drugs, such as ibuprofen (Figure 1).[3] The most common branched-chain fatty acid is phytanic acid, found in some meats and dairy products. Normally, it is metabolized by activation to its CoA ester, phytanoyl-CoA, then alpha-oxidation to pristanic acid.[4]

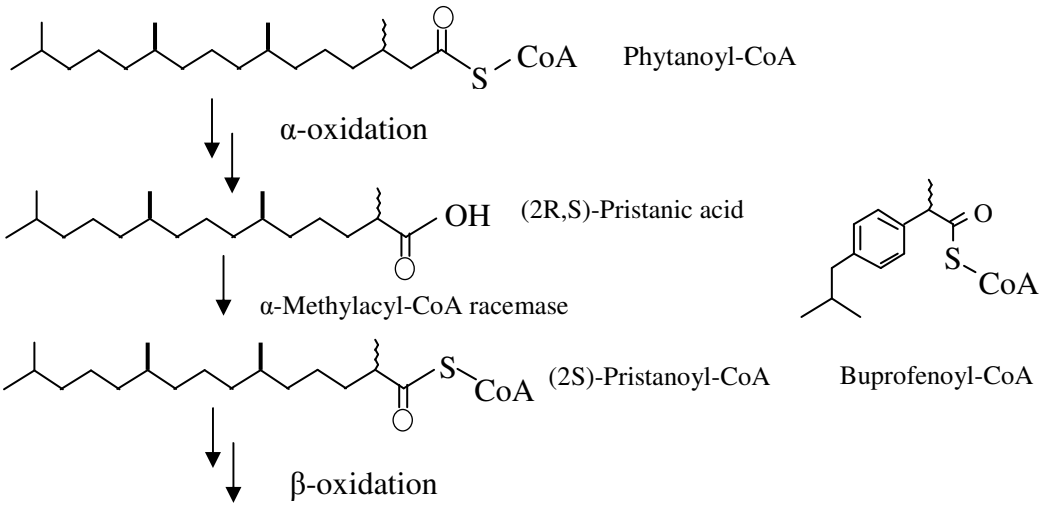

Figure 1. Peroxisomal degradation of phytanic acid to pristanic acid. [Figure from MD Lloyd and MD Threadgill.[3]]

Patients with Refsum disease are unable to degrade phytanic acid because of deficient activity of phytanoyl-CoA hydroxylase, a peroxisomal enzyme that catalyzes the first step of phytanic acid alpha-oxidation.[4] Consequently, they accumulate significant amounts of phytanic acid in plasma and tissues, which are thought to be the major cause of the pathology of the disease.[5]

Refsum disease is characterized clinically by atypical retinitis pigmentosa, peripheral polyneuropathy, cerebellar ataxia, anosmia, cardiomyopathy, conduction abnormalities, icthyosis, hyperkeratosis plantaris and palmaris, and epiphyseal dysplasia leading to characteristic shortening of the fourth toe, hammer toe, pes cavus, and osteochondritis.[4-6] The characteristic findings are slow conduction velocities on nerve conduction studies, elevated cerebrospinal fluid protein concentration (100 to 600 mg/dl) without an increase in cells, grossly abnormal electroretinogram, onion bulb formation and targetoid inclusions in Schwann cells on nerve biopsy, and plasma levels of phytanic acid of > 800 mmol.[4-7]

Treatment consists of strict reduction in dietary phytanic acid intake to 10-20mg/day (daily average: 50-100mg).[7] Plasma exchange can be considered if dietary control is inadequate.[8] This approach halts the progression of the disease, but does not reverse neurologic abnormalities completely. Ichthyosis, sensory neuropathy, and ataxia resolve in approximately that order, and electrocardiographic abnormalities may improve. However, treatment may not affect retinitis pigmentosa, hearing impairment, or anosmia.[7-9]

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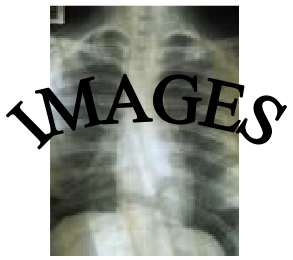
Keywords: heredopathia atactica polyneuritiformis, Refsum disease, ibuprofen, case report



Tardive Dyskinesia Presenting as a Tongue Ulceration

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A 56-year-old female with schizophrenia presented for evaluation of a tongue ulceration (left photo). The patient reported having repetitive, involuntary, protrusion of her tongue for at least three years. The patient was otherwise healthy, denied smoking or alcohol abuse, and was taking quetiapine for schizophrenia. Physical examination revealed poor dentition and a 20 mm by 10 mm tongue ulceration. Lymphadenopathy of the neck was not detected. Biopsy of the lesion showed reactive inflammation without evidence of malignancy. Dental care was provided and the quetiapine dose was reduced. Two months later, the lesion disappeared (right photo). Her involuntary movement, however, only mildly improved.

Patients with affective disorders appear to be at higher risk of developing tardive dyskinesia than those with schizophrenia.[1] Tardive dyskinesia typically starts after months or years of treatment with antipsychotics. Any part of body can be affected and may be manifested as a wide range of movements including myoclonic jerks, tics, chorea, and dystonia. However, it usually consists of involuntary movements involving the muscles of the tongue, lips, mouth, or face. With continuing antipsychotic treatment, the disorder can increase in severity and be irreversible.[2.]

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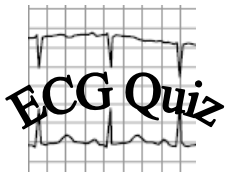
Keywords: drug-induced dyskinesia, tongue, ulcer



Unusual Cause of ST Elevation

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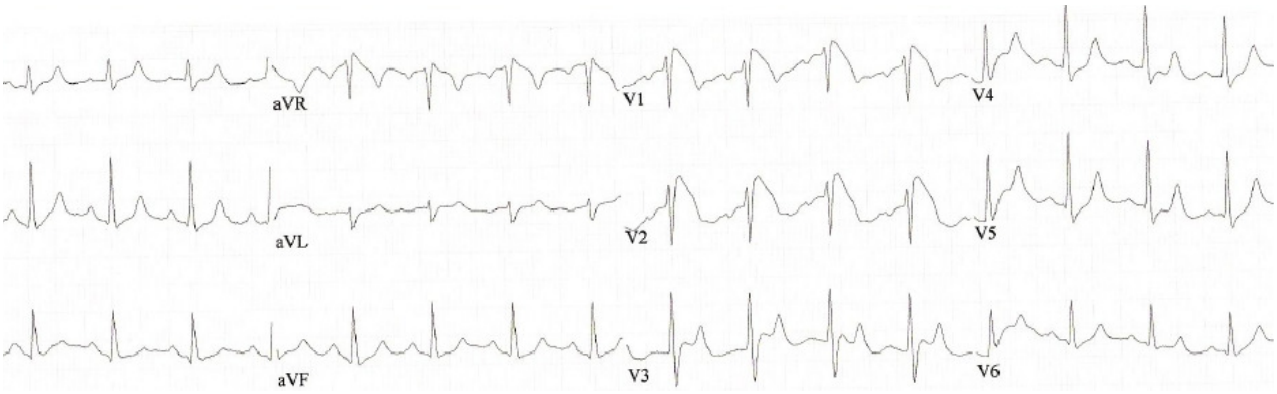
A 48-year-old woman with a history of major depressive disorder was found unresponsive at home. In the emergency room, no focal neurologic signs were present and computed tomography of the head revealed no acute abnormalities. Serum potassium level was 7 mEq / L and the serum level or tricyclic antidepressants was elevated.

The initial ECG showed:

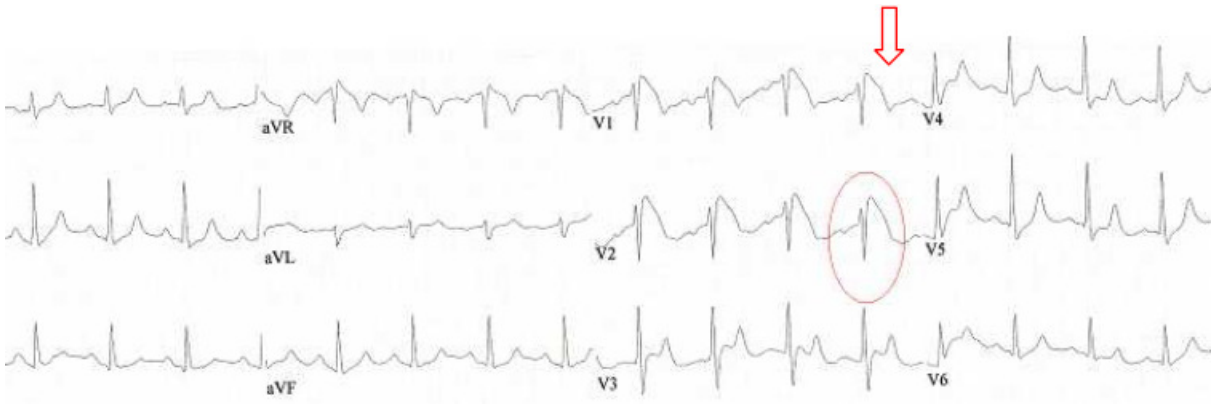


What is the diagnosis?

A) Acute anteroseptal ST segment elevation myocardial infarction
B) Ventricular aneurysm
C) Osborn waves
D) Right bundle branch block
E) Brugada-like ECG
F) Acute pericarditis
G) Epsilon waves
H) Normal ECG with early repolarization
I) Artifact

CORRECT ANSWER: E

Brugada-like ECG is a finding characterized by ST-segment elevation in right precordial leads V1-V3 and accompanied by a right bundle branch block (RBBB) morphology on the ECG.[1]

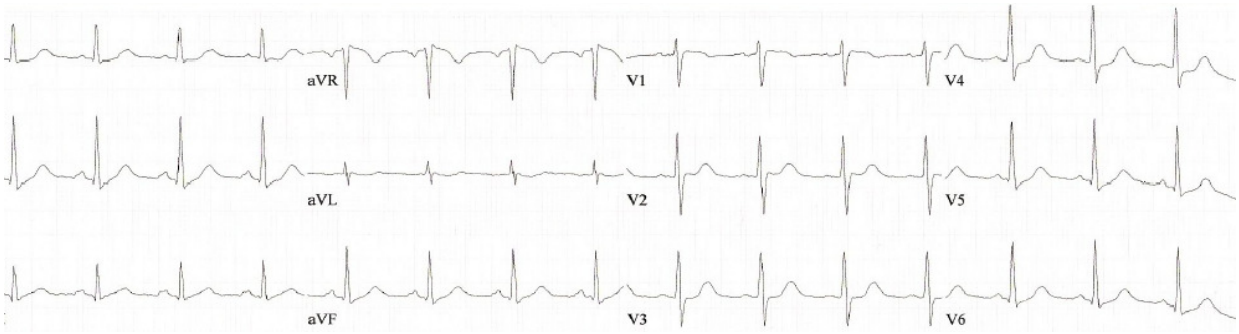


This pattern has been associated most commonly with Brugada Syndrome and also has been associated with certain drug intoxications[2], such as tricyclic antidepressants (amitriptyline, nortriptyline, desipramine, clomipramine), tetracyclic antidepressants (maprotiline), phenothiazine (perphenazine, cyamemazine), and selective serotonin reuptake inhibitors (fluoxetine), and first-generation histaminic H1 receptor antagonist (dimenhydrinate). In addition, cocaine use and certain electrolyte abnormalities, such as hyperkalemia and hypercalcemia, also can cause the Brugada-like pattern on ECG.[2]

Brugada syndrome is an autosomal dominant disease[3], due to a defect in the cardiac sodium channel that presents with syncope and sudden cardiac death in individuals with healthy heart.[2] Brugada syndrome is diagnosed when these ECG findings are associated with one of the following criteria[4]:

A) Documented ventricular fibrillation (VF)
B) Polymorphic ventricular tachycardia (VT)
C) Family history of sudden cardiac death at less than 45 years old
D) Brugada-like ECGs in family members
E) Inducibility of VT with programmed electrical stimulation
F) Syncope
G) Nocturnal agonal respiration

Because of the lack in these criteria, our patient was diagnosed with *Brugada-like ECG.* After correction of the hyperkalemia and treatment of the tricyclic intoxication, the repeated ECG was within normal limits, as shown below.



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Keywords: Brugada Syndrome, Brugada ECG pattern, tricyclic antidepressants, intoxification