The Impact of Epilepsy on Quality of Life

8

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Prior to epilepsy, I lead a healthy, active lifestyle, which included high school wrestling and I was a competitive baseball player until the age of 21. College included late nights out, drinking and socializing like other students. Shortly after graduation my idiopathic seizures [seizures without a known cause] began, initially once every 3 weeks; about 10 years into epilepsy I was having 20 cluster seizures/month with Trileptal [antiepileptic drug] providing the best, albeit not very effective, control. I believe stress played a role in some of the activity.

From 22 to 44 years of age I had approximately 3000 seizures; mostly complex partial and simple with about 15 generalized seizures that were triggered by sleep deprivation.

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Epilepsy is one of the most common chronic neurological conditions. The impact of epilepsy extends well beyond the direct effects of seizures and includes a number of challenges, which may lead to disability and severely reduced quality of life (QOL). Epilepsy can affect social, psychological, and physical health. For example, people with epilepsy, particularly those with refractory epilepsy (i.e., seizures that are not well-controlled with seizure medications), face diminished social support and family function, cognitive challenges, medical and psychiatric comorbidities, and stigmatization. Those with epilepsy also report more disability days, physical limitations in their daily activities, and lower annual income than other chronically ill groups (Wiebe, Bellhouse, Fallahay, & Eliasziw, 1999). QOL has now been acknowledged as an important clinical endpoint and has been reflected in the exponential rise in related research studies over time (Leone, Beghi, Righini, Apolone, & Mosconi, 2005).

The chapter will begin with a review of epilepsy as a syndrome, including incidence and causal mechanisms, and then proceed to outline the specific effects of epilepsy on quality of life for different subgroups and in different life spheres. A review of the current methods for assessing quality of life will be followed by treatment approaches for epilepsy.

Epilepsy: A Review

Epilepsy is a disorder that involves recurrent seizures. A seizure is the result of abnormal cerebral discharges that manifest as alterations in sensation, motor functions, and/or consciousness. Behavioral manifestations of seizures range from brief lapses of consciousness to stereotypic motor movements to full body convulsions.

Approximately 1–2 % of the population is affected by epilepsy, making it one of the most common neurological conditions. In the United States alone, more than two million individuals have epilepsy and in any given year, hundreds of thousands of new cases of epilepsy are diagnosed (Hirtz et al., 2007). The diagnostic criteria for epilepsy have remained unchanged for several years, and require the occurrence of at least two seizures, unrelated to any other illness or metabolic upset. There is a slightly higher rate of epilepsy in men than in women. The condition develops most commonly among individuals under 20 years of age, although increased rates are also seen in those over the age of 60. There are a number of epileptic syndromes associated with specific age groups, such as the neonatal seizures, infantile spasms, and febrile convulsions observed in young children. When new onset cases emerge in adulthood, epilepsy often is seen as a consequence of brain tumors, stroke, or traumatic brain injury. Epilepsy occurs at higher rates in individuals who fall in the range of intellectual disability or have some form of developmental delay.

The diagnosis of epilepsy is made by incorporating a comprehensive clinical history with documentation of electroencephalographic (EEG) changes. Clinical history integrates an individual's medical background and details of the seizure semiology which is defined as the changes in behavior observed before, during, and after events. The EEG provides a method for examining the underlying electrical brain activity associated with the seizures. Many seizures are characterized by specific patterns of electrical

abnormality. However, abnormal electrical discharges also occur in conditions that do not involve seizures. Many patients require comprehensive monitoring with simultaneous EEG and video recording for proper diagnosis. This enables physicians to observe the direct relationship between behavioral changes and abnormal brain activity.

The most comprehensive system currently in use to classify seizures types was formed by the Commission of the International League Against Epilepsy (Berg et al., 2010). This classification system has been developed and revised to reflect the most recent scientific knowledge of how seizures begin, spread and can best be treated. The first descriptor in the classification syndrome defines seizures based on how they begin. Generalized seizures are thought to arise throughout the brain or originate at one point and spread very quickly to networks in both sides of the brain, including cortical and subcortical structures. Focal seizures originate in one hemisphere, and sometimes in one specific small area of one side of the brain.

The second portion of the classification system considers the degree of impairment that occurs during a person's seizure and applies only to the generalized seizure types. Some seizure types include tonic–clonic (muscles stiffening—muscles spasms and jerking); other seizure types include absence (brief, sudden lapses of consciousness, staring spells) and myoclonic (brief twitching of muscle or muscle groups). With the current classification system, subtypes of focal epilepsy are not specified, although factors such as level of change in consciousness, and the nature of behavioral features of these seizures can be helpful in diagnosing and treating focal seizures.

This seizure classification system differs from causes of seizures or syndromes that are associated with particular patterns of seizures. Many forms of epilepsy have an identifiable cause, such as the presence of a tumor, the result of a traumatic brain injury, or some other demonstrable brain lesion. Some diseases or conditions are associated with increased risk for seizures. Some of these causes include genetic abnormalities or systemic factors, such as the lack of a certain enzyme. Some epilepsies are considered idiopathic—without a currently known cause. However, advances in structural brain-imaging techniques, such as magnetic resonance imaging (MRI), have allowed for improved detection of the cause of the seizures. Functional brain-imaging methods, such as positron emission tomography (PET), single photon emission computerized tomography (SPECT), functional MRI (fMRI), and magnetoencephalography (MEG) have advanced our ability to localize and understand the brain and the behavioral abnormalities associated with epilepsy. Therefore, some cases previously labeled as idiopathic are now found to be associated with subtle brain abnormalities. Having better understanding of the cause of the seizures can lead to improved treatment for individuals affected by epilepsy.

Epilepsy and Its Impact on Activities of Daily Living and Quality of Life

The World Health Organization defines health-related quality of life (HRQOL) as a state of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity (Jochheim, 1980). Stated differently, HRQOL refers to the

functional effect of an illness on a patient, as perceived by the patient. While seizures occur episodically, epilepsy is a chronic condition. The focus of HRQOL in epilepsy is on life *between* the seizures (i.e., in the inter-ictal period). The impact of stigma and fear of seizure occurrence are aspects that contribute to the continuous impact of the disorder and also major determinants in patient-reported quality of life (Giovagnoli, da Silva, Federico, & Cornelio, 2009).

The Effect of Stigma

Throughout history, those with epilepsy have been labeled holy or possessed as a result of changes in behavior during seizures. In other societies, these individuals were considered "insane" and were placed in asylums. The stigma related to epilepsy often compounds the negative physical impact of the disease and affects how individuals respond to disease burden. Research has shown that for adults with epilepsy, if a person experiences more exposure to stigma, they feel that they are less able to manage their own epilepsy, have more negative feelings about whether their seizures can be treated, tend to fill and take their medications less reliably, and report lower satisfaction with health care (DiIorio et al., 2003).

Cross-Cultural Influences

Social attitudes toward epilepsy and disability vary across ethnic and cultural groups. Fifteen percent of Austrian survey respondents indicated that they would object to their child marrying a person with epilepsy (Spatt et al., 2005). In the Czech Republic, one investigation showed that 29 % of survey respondents considered epilepsy to be a form of insanity (Novotna & Rektor, 2002). More than half of 1600 randomly selected informants in the United Kingdom agreed that people with epilepsy are treated differently, primarily by means of social avoidance and exclusion. Differences in treatment were attributed in part to views that people with epilepsy were not reliable and not normal (Jacoby, Gorry, Gamble, & Baker, 2004). In the same study, over one-fifth of the respondents agreed that people with epilepsy have more personality problems than those without. In East Timor, almost all people with epilepsy do not receive medical intervention, because Timorese communities hold the belief that epilepsy is not a physical health problem but rather is caused by evil spirits or curses (Amoroso, Zwi, Somerville, & Grove, 2006). At present, most East Timorese children with epilepsy do not attend school. Results of a survey in the United States showed comparable levels of stigma associated with epilepsy and AIDS, whereas stigma associated with diabetes mellitus was much less (Fernandes et al., 2007). In Cambodia, epilepsy has been long conceptualized by the public as a contagious disorder, including by inheritance, through sharing of saliva, sharing of food, via sexual contact, or casual contact (rubbing shoulders/shaking hands) (Bhalla et al., 2012). This conceptualization can contribute to fear of interacting with individuals with epilepsy, and is one contributing factor to stigmatization. In an ethnically diverse urban population, perceived stigma was at least as important as seizure freedom in determining quality of life, suggesting

this is an essential factor in treating individuals with epilepsy (Grant, Prus, & Nakhutina, 2013). Given the prevalence of these negative attitudes worldwide, it is likely that people with epilepsy will encounter them routinely. Higher rates of epilepsy in minority populations have been documented by some, however this finding might relate to differences in socioeconomic status, degree of access to health care, and regional environmental exposures (Banerjee, Filippi, & Hauser, 2009). Further investigation to understand these complex factors will help in determining risk and guiding interventions for the many individuals affected by epilepsy.

Epilepsy in Youth

Childhood epilepsy is among the most prevalent neurological conditions in the developing years, affecting between 0.5 and 1 % of children globally (Shinnar & Pellock, 2002). Treatment management for youth with epilepsy can be very complex and a number of patient and family factors must be considered to optimize treatment success and improve patient QOL. In addition, QOL is a dynamic process in children diagnosed with epilepsy, with some individuals experiencing significant improvement in QOL in the 2 years following diagnosis, and others experiencing poorer quality of life after being diagnosed with epilepsy. The individuals who reported poorer quality of life often experienced cognitive changes in that 2-year interval (Speechley et al., 2012). Issues related to ongoing development must also be considered. For example, adolescence marks the period during which autonomy and independence are fostered and when peer relationships are particularly important. Adolescents with epilepsy are at risk for developing social difficulties relative to their peers; this includes stigmatization, decreased social competence, increased social problems, and marked social isolation (Elliott, Lach, & Smith, 2005; Jakovljevic & Martinovic, 2006). As a result of factors related to seizures and their treatment, children with epilepsy are prone to academic underachievement secondary to multiple issues affecting learning and behavior (Sabbagh, Soria, Escolano, Bulteau, & Dellatolas, 2006).

Stigma is a critical component of QOL for adolescents with epilepsy. A large proportion of 19,000 teenagers surveyed in the United States carried negative perceptions of people with epilepsy (Austin, Shafer, & Deering, 2002). Just over half (52 %) of the teens had never heard of epilepsy, almost half (46 %) were not sure if it was contagious, and 40 % were not sure if people with epilepsy were dangerous. Only 31 % reported they would consider dating someone with epilepsy and 75 % thought teenagers with epilepsy were more likely to be bullied or picked on than their healthy peers. The way in which youth with epilepsy are being viewed in their surrounding environments is a crucial factor when considering QOL.

Women with Epilepsy

Relative to men with epilepsy, women with epilepsy face unique challenges. Women who are prescribed antiepileptic medication are at increased risk for osteomalacia (i.e., softening of bones), osteoporosis, bone fractures, as well as reduced vitamin D

levels (Yerby, 2000). Some women tend to experience seizures associated with their menstrual cycle (catamenial seizures), and thus can benefit from special consideration when physicians are selecting antiepileptic medications and regulating hormones.

With regards to pregnancy and fertility, women with epilepsy are at increased risk of experiencing a seizure during pregnancy (Yerby, Kaplan, & Tran, 2004) and while giving birth. There are also risks to the developing child. If a child is exposed to antiepileptic medications in utero (particularly valproate used in the first trimester) the child is at increased risk for abnormal physical development or abnormal cognitive development (Harden et al., 2009). Use of multiple medications simultaneously (polytherapy) to control seizures in the pregnant woman also leads to increased risk for physical malformations in the developing child and can have a negative impact on cognition after the child is born. One specific set of malformations that appears to occur at increased rates for children who are born to women with epilepsy are neural tube defects (Yerby et al., 2004).

If a woman experiences a seizure while she is pregnant, the developing neonate is at risk for physical trauma, if the mother falls and her abdomen is injured. If a pregnant woman experiences a generalized and/or prolonged seizure, it can put the developing child at risk for experiencing periods of low oxygen and ischemic injury (stroke) (Yerby et al., 2004). Women with epilepsy are also at increased risk for spontaneous abortion, as well as death of the developing child in utero or during birth (Yerby et al., 2004). Seizure control can be difficult to attain and prescribing physicians are often hesitant to modify a successful medication regimen. Therefore, medications need to be closely monitored and adjusted to provide the best seizure control in addition to the safest conditions for the developing child. It should be emphasized that most women with epilepsy can have healthy children, particularly when vitamin supplementation and medication monitoring are appropriately conducted.

Household Duties and Activities of Daily Living

Given the often unpredictable nature of seizures, safety concerns can restrict an individual's ability to engage in some aspects of household duties. For example, those with uncontrolled seizures are often discouraged from using power tools or other motorized machines that might lead to injury. Increased risk of burns while cooking or showering during a seizure or due to confusion in the post-seizure period (Spitz, Towbin, Shantz, & Adler, 1994) can lead to reduced participation and/or required supervision of these activities. Other activities, such as swimming, can be limited due to fear that the individual will experience a seizure and be at risk for drowning (Mayes, 2009). Air travel also has been known to increase risk of seizures, which can reduce desire or ability to travel long distances (Trevorrow, 2006). Depending on seizure frequency and predictability, it can be the case that loved ones prefer that a person with epilepsy not travel on their own.

Employment

There is a long history of legal discrimination against people with epilepsy, which includes restrictions on marriage, fertility, and immigration. In some countries, these discriminatory practices have only recently been abandoned. One major area of restriction is employment. People with epilepsy have higher rates of unemployment, underemployment, and diminished earning power as a result of their condition (Chaplin, Wester, & Tomson, 1998; Smeets, van Lierop, Vanhoutvin, Aldenkamp, & Nijhuis, 2007). Higher rates of unemployment have been identified in individuals with more frequent seizures (Gloag, 1985). While some evidence suggests that for those with well-controlled epilepsy, employment rates are similar to the general population, people with epilepsy are more likely to be employed in manual labor/unskilled positions and are less likely to achieve employment levels that correspond to their qualifications (Chaplin et al., 1998). The causal mechanism for unequal employment has been hypothesized to relate to an interaction of environmental/social factors (e.g., stigmatization) as well as internal factors (e.g., diminished locus of control) (Smeets et al., 2007). In most developed countries, there are only a handful of occupations that are prohibited for people with epilepsy, including airline pilots and certain roles in the armed forces. However, restrictions in operating motor vehicles can limit access to some employment opportunities. These restrictions are in place to protect the life of the individual with epilepsy or others, in the event of a seizure. An additional factor that people with epilepsy consider in employment settings is whether to share their neurological history with coworkers/supervisors. Disclosure can be an important safety precaution (so that others know the best course of action for the individual if they experience a seizure), but many individuals report being treated differently in employment settings after coworkers become aware of their status as a person with epilepsy (Kerr, Nixon, & Angalakuditi, 2011). Vocational rehabilitation services are available to address the individualized needs of people with epilepsy.

> *Professionally, on occasion I was called upon to drive to a client. I'd hire a car service not thinking to bill it to the company. Figuratively and literally I viewed epilepsy with a shrug of my shoulders, "it's my allergy, sometimes I space out."*

Social Functioning/Participation in Society

Lack of social support can be more debilitating to individuals with epilepsy than high seizure rates. For persons with epilepsy, social support networks tend to be restricted to family, neighbors, and health care providers (Hills & Baker, 1992). While many individuals with epilepsy do not have entire or any recollection of the nature of their events, it can be distressing for loved ones or even strangers to witness a seizure (Kerr et al., 2011). Adolescents and young adults with epilepsy report that it is difficult for them to be in romantic relationships because of having experienced rejection and/or because they feel frustrated by what is perceived to be

over-involvement by parents or guardians (McEwan, Espie, Metcalfe, Brodie, & Wilson, 2004). Social support consistently has been found to be a protective variable for persons with epilepsy and lack of social support has been shown to be a significant predictor of depressive symptoms (Bishop, Berven, Hermann, & Chan, 2002). Strong social support contributes to increased perceived self-efficacy, which leads to improved quality of life (Amir, Roziner, Knoll, & Neufeld, 1999). Increasing strength and number of interpersonal relationships is a potentially modifiable domain that might lead to improved quality of life for these individuals.

I never married when most of my contemporaries were starting and building families. Was this because of the seizure activity? I wish I knew and that I had married. In my early 30s I met a wonderful woman, we lived together for 3 years and it was the same time that I was starting my company. I was unable to focus on both the business and the relationship and eventually, the young lady got tired of waiting for a proposal. I think the seizures clouded my emotions as well as focusing ability. Plus, did I want to/was I capable of taking on that responsibility while having so many seizures? I was very non-committal with other relationships thereafter, too.

I wonder.... had it not been for thousands of seizures during my 20s into early 40s, would I have married? The biggest challenge today, my contemporaries have made families, I still want one but did I miss that opportunity? I tend to be with people younger than me as we've similar social interests.

Driving

To assure the safety of the individual with epilepsy as well as others on the road, most states have policies in place to determine if an individual who has experienced a seizure is eligible to drive. Typically, one requirement for a person with epilepsy to obtain their driver's license is that they have been seizure free for a specific period of time (often 1 year). Documentation from a physician, stating that the individual is able to drive safely, is often required. Many states require regular submission of medical reports. The required documentation of medical reports can either be required for a specified amount of time or can be required for as long as the person remains licensed.

Restrictions on driving can create a stigma (i.e., mark an individual as different from peers) and very often leads to decreased freedom of movement. For individuals who are affected by epilepsy prior to driving-age, restrictions on driving can become a focus during adolescence, when peers are first obtaining their driver's licenses and gaining independence from parents or caregivers. Often, adults who experience seizures after they have been driving for some time experience significant alteration in their previous activities. Such individuals may rely on individuals in their social networks, or find alternatives such as hiring drivers or moving to locations with accessible public transportation. The loss of this ability can lead to restricted employment, educational, and social opportunities.

My license of course was suspended, but living in NYC limited the consequences. Never did I let epilepsy dictate my life, nor did I ever hide my condition. Weekends on Long Island, friends, family and taxis provided adequate mobility without too much frustration. There were instances where I was disappointed about having to wait for a ride, or not being able to pick up a date by car.

Emotional Problems

Overall rates of psychiatric illness are higher among persons with epilepsy than in the general population. Higher rates of psychosis, depression, anxiety, personality disorders, suicidality, and sexual dysfunction have been reported (Morrell, Sperling, Stecker, & Dichter, 1994; Rai et al., 2012; Tellez-Zenteno, Patten, Jette, Williams, & Wiebe, 2007; Whitman, Hermann, & Gordon, 1984). However, it is unclear whether the rates of psychiatric disturbance are higher in individuals with epilepsy in comparison to populations with other chronic medical conditions. Individuals with all subtypes of epilepsy are at increased risk for experiencing psychosis, and family history of seizures also leads to increased risk for psychosis (Clarke et al., 2012). Some caution is warranted when interpreting these results, as these investigations are typically conducted on patients appearing at specialized centers for treatment of the most severe forms of epilepsy.

There are striking parallels between behaviors resulting from seizures and symptoms associated with various psychiatric conditions. For example, some hallucinations and perceptual alterations resulting from temporal lobe seizures (i.e., during the seizure) closely resemble symptoms experienced by patients with schizophrenia (Stevens, 1999). The brain mechanisms underlying epilepsy therefore provide a valuable model for understanding the biology of schizophrenia and other psychiatric illnesses. Epilepsy has been used as an analog for understanding the brain basis of aggression and the cyclical disorders of mood and behavior (Post & Weiss, 1996). Controversies exist over whether some forms of aggressive behavior may actually represent the effects of "subclinical" seizures (Ito et al., 2007). Aggression in the context of postictal psychosis (difficulty understanding reality that occurs in the period after a seizure) has been documented in some individuals (Hilger et al., 2013).

Epilepsy can affect mood and personality. Some investigators have reported that patients with temporal lobe seizures are prone to changes in personality, reflecting increased electrical activity in the limbic region (Hermann & Riel, 1981). Manifestations of this personality type may include increased writing behavior, higher levels of emotionality, and changes in sexual behavior. Depression and anxiety are commonly experienced as a result of biological factors and as a psychological reaction to chronic illness. Individuals with epilepsy commonly experience "learned helplessness" as epilepsy is a condition characterized by an unpredictable and abrupt loss of control (Hoppe & Elger, 2011).

> *As the seizures accumulated, I'd become slightly depressed, though didn't realize until post-surgery. Now that I'm cured; as time passes, I continue to get stronger cognitive skills; processing items faster and able to multi-task. The lingering effects of epilepsy are; very poor short term memory, focusing is a bit weak at times, and depression. Depression was actually made worse immediately following the surgery, I would not get off the couch, found myself at times crying for no apparent reason and regularly doing so, each morning. My seizures were right front temporal, had the activity continued the depression would probably have eventually surpassed the level precipitated by surgery. Zoloft and therapy have controlled the bouts of sadness.*

Nonepileptic Events

Nonepileptic events are events that look like seizures but are not due to abnormal electrical activity in the brain. Some persons are known to exhibit recurrent, short-term behavioral changes that might appear to be a seizure but that do not have underlying electrical brain abnormality. It can be difficult to determine if such events are caused by seizures, and simultaneous EEG and video recording, interpreted by an epilepsy specialist are needed for proper diagnosis. Further, individuals who have seizures also at times have nonepileptic events. Therefore, appropriate diagnosis requires specialists to determine the best course of treatment. Misdiagnosis of nonepileptic seizures as epileptic seizures leads to potentially dangerous medical interventions such as inappropriate use of medications and at times has even led to invasive (i.e., surgical) interventions (Reuber, Fernandez, Bauer, Helmstaedter, & Elger, 2002). Several explanatory models have been proposed to explain nonepileptic seizures and they are often considered to be the result of complex psychological factors that may include conversion reaction or attempts to obtain secondary gain. The onset of nonepileptic seizures is often preceded by physical and/or psychological stressors (Bowman & Markand, 1999). High prevalence of physical/sexual abuse and other trauma are noted in groups with nonepileptic seizures (Fiszman, Alves-Leon, Nunes, D'Andrea, & Figueira, 2004) and elevated rates of post-traumatic stress disorder (PTSD) have been documented in this population (Betts & Boden, 1992). It is therefore important that these individuals be identified and provided with appropriate treatment. Psychotherapy has shown some promise for treating nonepileptic seizures (Goldstein et al., 2010).

Cognitive Problems

An important subgroup of people with epilepsy is those with learning disability and developmental delays. Epilepsy occurs much more frequently in people with intellectual disabilities than in the general population (approximately 20–30 times more common), with higher prevalence rates noted among those with more severe intellectual disability (Espie et al., 2001). In this subgroup, problems with expressive and receptive language and impairments in abstract, conceptual, and reflective thinking are common. This represents a major obstacle when trying to gather information from the patient, which can also make it more challenging to design appropriate interventions.

In addition to, or independent of, more generalized effects on intellectual functioning, other cognitive deficits are a common consequence of epilepsy. Children with epilepsy, as a group, are at risk for developing learning and behavioral problems (Bourgeois, 1998). Earlier age of seizure onset often predicts more severe cognitive difficulties later in life (Berg et al., 2008; Dikmen, Matthews, & Harley, 1977).

However, just as the cause, frequency of seizures and the nature of seizures varies widely, so does the range of cognitive ability/impairment in the population. Many individuals with epilepsy experience mild impairments in memory and

attention that may be a result of direct (i.e., the seizures, an underlying brain abnormality) or indirect (i.e., medication side effects, affective disorders) effects of epilepsy (Baker, Taylor, Aldenkamp, & Grp, 2011; Loring, Marino, & Meador, 2007). Seizures can affect other aspects of cognition, including slowed thinking speed, slowed motor speed and/or impaired coordination/fine motor skills, difficulty coming up with words, difficulty thinking abstractly, and difficulty with problem solving, among others. Specific patterns of cognitive dysfunction may be seen among patients with seizures arising from focal brain regions. For example, it is well known that patients with left temporal lobe seizures exhibit relatively specific impairments in verbal memory while their recall of spatial (visual) information is less affected (Delaney, Rosen, Mattson, & Novelly, 1980; Milner, 1972).

These cognitive difficulties, whether as a direct result of seizure activity or due to medication side effects, can significantly affect an individual's ability to engage effectively in everyday tasks. As an example, an activity often required in this population is managing medications. Some cognitive requirements of this task include memory ("Did I take my morning dose?") and planning ("I need to call the pharmacy ahead of time and refill my prescription"). If a person has difficulty in with either of these cognitive abilities, it can affect their ability to be able to manage their own medical care.

Neuropsychological testing provides the most sensitive and reliable means of identifying cognitive abnormalities. Studies of patients undergoing surgical procedures such as temporal lobe resection and callosotomy (surgically separating the fibers that connect the right and left hemisphere) have contributed to knowledge of neuroanatomic theories of memory functioning and hemispheric specialization. Information from these studies has enriched the body of knowledge on brain–behavior relationships, which can be extended to better understand other neurological conditions. In addition to neuropsychological testing, improvements in functional and structural neuroimaging, advances in pharmacotherapy and surgical interventions have led to more diverse interventions for treatment of epilepsy.

> *I think the seizures impacted my ability to focus on tasks and overall processing… the accumulation of seizures compounded this challenge. Despite this, at age 31, I started my own media company working around these challenges; I used a dictaphone to make notes and I probably worked about 15% longer to accomplish a task than if had I not had seizures in order to compensate for my inability to focus.*

Assessment of Quality of Life in Epilepsy

Historically, the efficacy of a new intervention for treatment of epilepsy was based on clinical endpoints (e.g., seizure type, severity, frequency, adverse effects), rather than on psychosocial factors. In 1998, the Commission on Outcome Measurement emphasized that quality of life is an important consideration to better understand the burden of epilepsy (Baker et al., 1998). In response, a number of general and epilepsy-specific QOL scales have been developed. Many of these tools are not routinely used in clinical practice and at present, and there are no specific guidelines

to identify the best measures and methods for assessing QOL in patients with epilepsy. This makes it difficult for researchers and clinicians to determine the most appropriate instruments for their purpose. Two approaches to the measurement of HRQOL utilize *quantitative* analyses or *qualitative* information from the patient and/or his or her family.

Quantitative Approaches

The more recognized and widely used HRQOL measures in epilepsy are the *generic* and *disease-* or *condition-specific* instruments. Generic instruments are not specific to any age, disease, or treatment group. Well-known generic instruments include the *RAND 36-Item Health Survey* (*SF-36*; Hays, Sherbourne, & Mazel, 1993; Ware et al., 1995), the *Sickness Impact Profile* (Bergner, Bobbitt, Carter, & Gilson, 1981), *McMaster Health Index Questionnaire* (Sackett et al., 1977), and the *Dartmouth COOP Functional Charts* (Nelson, Landgraf, Hays, Wasson, & Kirk, 1990). These instruments have the advantage that the data acquired can be compared across demographic or clinical populations. A potential limitation of these tools is that they might lack the sensitivity to detect subtle aspects of specific conditions or disorders (in this case, epilepsy) in a way that provides meaningful information to patients and professionals. A recent initiative, funded by the National Institute of Neurological Disorders, has been to develop the Neuro-QOL, an instrument to assess HRQOL associated with common neurological disorders (stroke, multiple sclerosis, Parkinson's disease, epilepsy, amyotrophic lateral sclerosis) (Gershon et al., 2012). This instrument could prove to be sufficiently general to serve a large population of affected individuals, while being specific enough to address aspects of QOL that arise specifically in disorders with neurological involvement.

Disease- or *condition-specific* HRQOL instruments assess aspects of a particular condition. They are generally considered to be more relevant and sensitive to the nuances of each disorder. On the other hand, they provide data that address a narrower range of issues than generic instruments, and it is usually difficult, if not impossible, to combine data from one disease-specific measure to another. The focus of the next section is primarily on condition-specific measures that explore the HRQOL of adults with epilepsy using quantitative measures. Measures previously identified as preferred for use in epilepsy are reviewed (Jacoby, Baker, Crossley, & Schachter, 2013; Leone et al., 2005).

Single Disease-Specific Scales

The *Epilepsy Surgery Inventory-55 (ESI-55)* was developed to assess outcome following epilepsy surgery (Vickrey, 1993; Vickrey et al., 1992). Three domains are assessed: general functioning (health perception, energy/fatigue, overall QOL, social function), mental functioning (emotional well-being, cognitive function,

role limitations due to emotional problems, role limitations due to memory problems), and physical functioning (role limitations due to physical problems, physical ability, freedom from pain). *The Quality of Life in Epilepsy Instruments (QOLIE 89, 31, and 10)* can be used with a wider range of epilepsy severities, including those with low-to-moderate seizure frequency. The original version of the instrument has 89 items with four primary factors (cognitive, mental health, and physical health). The epilepsy-related items include seizure severity, fear of having a seizure, the associated loss of control over one's life, cognitive and behavioral dysfunction, social limitations and stigma, sexual functioning, driving restrictions, and medication side effects. The *QOLIE-31* (Cramer et al., 1998) is reduced to 31 items and two factors: emotional/psychological issues and cognitive issues. The *QOLIE-10* (Cramer, Perrine, Devinsky, & Meador, 1996) is a 10-item brief screening instrument which yields three factors: epilepsy-specific effects, mental health, and role limitations.

The *Epilepsy Foundation (EF) Concerns Index* (Gillham et al., 1996; Viikinsalo, Gilliam, Faught, & Kuzniecky, 1997) contains 20 items reflecting concerns related to driving, independence, work, school, family, seizure and medication side-effects, mood and anxiety, and social functioning. The *Subjective Handicap of Epilepsy Scale (SHE)* was developed to assess the subjective impact of epilepsy on functional ability (O'Donoghue, Duncan, & Sander, 1998) via domains of mobility, orientation, physical independence, occupation, social integration, and economic self-sufficiency. The *Side Effects and Life Satisfaction (SEALS)* inventory focuses on the individual's experience with antiepileptic medication therapy (Gillham, Bryant-Comstock, & Kane, 2000) with five subscales included in the battery focusing on: Worry, Temper, Cognition, Dysphoria, and Tiredness.

Test Batteries to Assess HrQOL

The *Health-Related Quality of Life Questionnaire for People with Epilepsy (HRQLQ-E)* (Wagner et al., 1995) consists of 171 items selected on the basis of literature review and discussions with patients and clinicians. The *HRQLQ-E* is comprised of the UK version of the *RAND 36-item Health Survey* (Jenkinson, Wright, & Coulter, 1993), in combination with measures of general health, epilepsy burden (Jacoby, Baker, Smith, Dewey, & Chadwick, 1993), seizure severity (Baker et al., 1991), epilepsy-specific concerns, an epilepsy-specific mastery scale (adapted from Pearlin & Schooler, 1978), symptom occurrence and AED-related effects, as well as two open-ended questions. *The Liverpool Battery HRQOL Battery* includes measures of physical, social, and psychological functioning. Various instruments can be selected and combined to address specific research or clinical questions (Baker, Jacoby, Smith, Dewey, & Chadwick, 1994; Baker, Smith, Dewey, Jacoby, & Chadwick, 1993; Jacoby et al., 1993). However, this strategy limits cross-study comparisons.

Psychosocial Assessments

Washington Psychosocial Seizure Inventory (WPSI) (Dodrill, Batzel, Queisser, & Temkin, 1980) focuses on psychosocial problems associated with epilepsy, including family background, emotional adjustment, interpersonal adjustment, vocational adjustment, financial status, adjustment to seizures, medicine and medical management, and overall psychosocial functioning.

Assessments in Children and Adolescents with Epilepsy

Fewer QOL scales are developed for use with youth with epilepsy. While there has been a tendency to supplement self-report measures with proxy (typically parent/guardian) reports, it is preferred that young people themselves, and not a proxy, should be the primary source of information regarding their QOL (McEwan, Espie, & Metcalfe, 2004). Therefore, tools that are developed for this population have had the goal of accurately measuring QOL from the young person's perspective.

Condition-Specific Scales for Children and Adolescents

The *Quality of Life Instrument for Adolescents* (Cramer et al., 1999) was developed for use with adolescents, aged 11–18 years. The 48 items comprise eight subscales, including Epilepsy Impact, Memory and Concentration, Attitudes toward Epilepsy, Physical Functioning, Stigma, Social Support, School Behavior, Health Perceptions, and a total summary score. The *Glasgow Epilepsy Outcome Scale for Young Persons (GEOS-YP)* (Townshend et al., 2008) is a 50-item measure, which was developed based on the perspective of young people, aged 10–18. Correlations were also found between the *GEOS-YP* and measures of generic QOL, self-esteem, and seizure frequency. The *Quality of Life in Childhood Epilepsy Questionnaire (QOLCE)* (Sabaz et al., 2000) is a parent-reported HRQOL for youth aged 4–18. The measure is sensitive to epilepsy severity and shows significant relationships with number of antiepileptic medications and neuropsychological variables. Originally developed in Australia, it has been adapted for use for North American populations (Sabaz et al., 2003).

The *Adolescent Psychosocial Seizure Inventory (APSI)* (Batzel et al., 1991) is an adolescent version of the *WPSI.* Adolescents with epilepsy from five centers in North America completed the *APSI* and were interviewed by professionals with respect to their adjustment in eight psychosocial areas to develop this measure. The *Impact of Pediatric Epilepsy Scale (IPES)* (Camfield, Breau, & Camfield, 2001) is designed to be completed by a parent/guardian of a child with epilepsy. Three components of the measure were identified: Outside Activity Participation, Social Well-being, and Home Life.

QOL Assessment with Individuals with Epilepsy and Intellectual Disability

Clinicians often rely on information from caregivers, given the challenges in obtaining the individual's perspective. To date, only two measures were developed specifically to assess self-reported HRQOL in persons with epilepsy and diminished cognitive functioning: *The Glasgow Epilepsy Outcome Scale (GEOS)* (Espie et al., 2001) and the *Epilepsy and Learning Disabilities Quality of Life Questionnaire (ELDQOL)* (Buck, Smith, Appleton, Baker, & Jacoby, 2007).

Treatment

Medication and Surgical Treatment

Antiepileptic drugs (AEDs) provide the most common and effective form of treatment for epilepsy. AEDs act by altering the potential for abnormal cerebral discharge to reduce seizure activity. The number of drugs available to treat epilepsy has increased dramatically in the last several decades (Chong & Bazil, 2010). While many patients may require more than one AED for optimal seizure control, the goal is to minimize the number of drugs to reduce possible side effects. Drug-related adverse events are not uncommon, especially when several AEDs are needed to control seizures, and, as mentioned above, side effects in themselves can be disabling.

Approximately 30 % of treated individuals do not respond adequately to drug management (Cascino, 2008). In these cases, many benefit from treatment with epilepsy surgery. Surgical intervention involves removing the abnormal portion of the brain that has been identified as causing the seizure, guided by extensive presurgical testing. For those individuals whose seizures cannot be controlled with only AEDs, consideration of surgery depends on a number of factors, including whether the seizure origin is identifiable, and if the seizure origin lies in a resectable area of the brain (most commonly the temporal lobes). In the last two decades, the role of intracranial surgery has grown considerably.

Behavioral and Alternative Treatment

Alternative methods for treating epilepsy are available, though their efficacy remains less established. For example, individuals with some forms of epilepsy may benefit from changes in diet (e.g., ketogenic diet) (Neal et al., 2008). There is also evidence for a reduction in seizures after surgical implantation of an electrical device designed to stimulate the vagal nerve (Cascino, 2008). Others exhibit a reduction in seizure frequency after receiving focused behavioral treatment (Tan et al., 2009).

More recently, there have been investigations focused on psychosocial interventions with the goal of improving quality of life in epilepsy. While the sample sizes in these investigations are small, positive effects on quality of life or other mood

variables have been detected. Some studies have focused on psychoeducation, leading to reduction of fear for individuals with epilepsy (Helde, Bovim, Brathen, & Brodtkorb, 2005; Helgeson, Mittan, Tan, & Chayasirisobhon, 1990) or for parents of children with epilepsy (Shore, Perkins, & Austin, 2008). Education of family/friends and provision of support groups may increase social support for adults with epilepsy and further decrease internal stigma. Other studies have incorporated interventions with a cognitive-behavioral orientation to increase self-management of epilepsy and decrease stigma (Wagner, Smith, Ferguson, van Bakergem, & Hrisko, 2010). Interventions that are initiated at the time of first diagnosis may prevent the development of internal stigma, leading to improved outcomes. Clearly, based on the large population affected by epilepsy and the risk for diminished quality of life, ongoing investigations to identify appropriate interventions aimed to serve the diverse array of individuals affected by epilepsy are invaluable.

> *Never did I allow epilepsy to define me nor get in the way of a great life …. It's a choice, who's going to win, me or the epilepsy? I never hid the disorder, if anyone had a problem with it that was their issue, not mine. Everyone has something, for me the biggest challenge was epilepsy, and I won.*

Conclusion

Epilepsy is a rather frequent neurological condition exerting significant impact on QOL, secondary to the direct effects of seizures and the effects of the seizures themselves on behavior and cognition. Because of numerous social and culturally based misconceptions, people with epilepsy have undergone centuries of stigma, which has had a continuing effect on their social status. In spite of increased understanding of the condition, people with epilepsy continue to experience restrictions in their household, occupational, and social functioning, creating a marked impact on QOL. Individuals trained in the assessment, treatment, and study of epilepsy now recognize QOL as an important clinical component and target of treatment interventions and have thus developed a number of empirically validated instruments for assessment of QOL in this population. Nonetheless, further research is needed into the factors contributing to reduced QOL in patients with epilepsy with a greater number of interventions designed to address this critically important clinical endpoint.

References

Amir, M., Roziner, I., Knoll, A., & Neufeld, M. Y. (1999). Self-efficacy and social support as mediators in the relation between disease severity and quality of life in patients with epilepsy. *Epilepsia, 40*(2), 216–224. doi:10.1111/j.1528-1157.1999.tb02078.x.

Amoroso, C., Zwi, A., Somerville, E., & Grove, N. (2006). Epilepsy and stigma. *Lancet, 367*(9517), 1143–1144. doi:10.1016/S0140-6736(06)68503-6.

Austin, J. K., Shafer, P. O., & Deering, J. B. (2002). Epilepsy familiarity, knowledge, and perceptions of stigma: Report from a survey of adolescents in the general population. *Epilepsy & Behavior, 3*(4), 368–375. doi:10.1016/S1525-5050(02)00042-2.

Baker, G. A., Camfield, C., Camfield, P., Cramer, J. A., Elger, C. E., Johnson, A. L., et al. (1998). Commission on outcome measurement in epilepsy, 1994-1997: Final report. *Epilepsia, 39*(2), 213–231. doi:10.1111/j.1528-1157.1998.tb01361.x.

Baker, G. A., Jacoby, A., Smith, D. F., Dewey, M. E., & Chadwick, W. (1994). Development of a novel scale to assess life fulfillment as part of the further refinement of a quality-of-life model for epilepsy. *Epilepsia, 35*(3), 591–596. doi:10.1111/j.1528-1157.1994.tb02479.x.

Baker, G. A., Smith, D. F., Dewey, M., Jacoby, A., & Chadwick, D. W. (1993). The initial development of a health-related quality-of-life model as an outcome measure in epilepsy. *Epilepsy Research, 16*(1), 65–81. doi:10.1016/0920-1211(93)90041-5.

Baker, G. A., Smith, D. F., Dewey, M., Morrow, J., Crawford, P. M., & Chadwick, D. W. (1991). The development of a seizure severity scale as an outcome measure in epilepsy. *Epilepsy Research, 8*(3), 245–251. doi:10.1016/0920-1211(91)90071-M.

Baker, G. A., Taylor, J., Aldenkamp, A. P., & Grp, S. (2011). Newly diagnosed epilepsy: Cognitive outcome after 12 months. *Epilepsia, 52*(6), 1084–1091. doi:10.1111/j.1528-1167.2011.03043.x.

Banerjee, P. N., Filippi, D., & Hauser, W. A. (2009). The descriptive epidemiology of epilepsy—a review. *Epilepsy Research, 85*(1), 31–45. doi:10.1016/j.eplepsyres.2009.03.003.

Batzel, L. W., Dodrill, C. B., Dubinsky, B. L., Ziegler, R. G., Connolly, J. E., Freeman, R. D., et al. (1991). An objective method for the assessment of psychosocial problems in adolescents with epilepsy. *Epilepsia, 32*(2), 202–211. doi:10.1111/j.1528-1157.1991.tb05245.x.

Berg, A. T., Berkovic, S. F., Brodie, M. J., Buchhalter, J., Cross, J. H., van Emde Boas, W., et al. (2010). Revised terminology and concepts for organization of seizures and epilepsies: Report of the ILAE Commission on Classification and Terminology, 2005-2009. *Epilepsia, 51*(4), 676–685. doi:10.1111/j.1528-1167.2010.02522.x.

Berg, A. T., Langfitt, J. T., Testa, F. M., Levy, S. R., DiMario, F., Westerveld, M., et al. (2008). Global cognitive function in children with epilepsy: A community-based study. *Epilepsia, 49*(4), 608–614. doi:10.1111/j.1528-1167.2007.01461.x.

Bergner, M., Bobbitt, R. A., Carter, W. B., & Gilson, B. S. (1981). The sickness impact profile—development and final revision of a health-status measure. *Medical Care, 19*(8), 787–805. doi:10.1097/00005650-198108000-00001.

Betts, T., & Boden, S. (1992). Diagnosis, management and prognosis of a group of 128 patients with non-epileptic attack disorder. Part II. Previous childhood sexual abuse in the aetiology of these disorders. *Seizure, 1*(1), 27–32.

Bhalla, D., Chea, K., Hun, C., Vannareth, M., Huc, P., Chan, S., et al. (2012). Population-based study of epilepsy in Cambodia associated factors, measures of impact, stigma, quality of life, knowledge-attitude-practice, and treatment gap. *PloS One, 7*(10), e46296. doi:10.1371/journal.pone.0046296.

Bishop, M., Berven, N. L., Hermann, B. P., & Chan, F. (2002). Quality of life among adults with epilepsy: An exploratory model. *Rehabilitation Counseling Bulletin, 45*(2), 87–95. doi:10.1177/003435520204500203.

Bourgeois, B. F. D. (1998). Antiepileptic drugs, learning, and behavior in childhood epilepsy. *Epilepsia, 39*(9), 913–921. doi:10.1111/j.1528-1157.1998.tb01440.x.

Bowman, E. S., & Markand, O. N. (1999). The contribution of life events to pseudoseizure occurrence in adults. *Bulletin of the Menninger Clinic, 63*(1), 70–88.

Buck, D., Smith, M., Appleton, R., Baker, G. A., & Jacoby, A. (2007). The development and validation of the epilepsy and learning disabilities quality of life (ELDQOL) scale. *Epilepsy & Behavior, 10*(1), 38–43. doi:10.1016/j.yebeh.2006.10.010.

Camfield, C., Breau, L., & Camfield, P. (2001). Impact of pediatric epilepsy on the family: A new scale for clinical and research use. *Epilepsia, 42*(1), 104–112.

Cascino, G. D. (2008). When drugs and surgery don't work. *Epilepsia, 49*(Suppl 9), 79–84. doi:10.1111/j.1528-1167.2008.01930.x.

Chaplin, J. E., Wester, A., & Tomson, T. (1998). Factors associated with the employment problems of people with established epilepsy. *Seizure-European Journal of Epilepsy, 7*(4), 299–303. doi:10.1016/S1059-1311(98)80022-8.

Chong, D. J., & Bazil, C. W. (2010). Update on anticonvulsant drugs. *Current Neurology and Neuroscience Reports, 10*(4), 308–318. doi:10.1007/s11910-010-0120-8.

Clarke, M. C., Tanskanen, A., Huttunen, M. O., Clancy, M., Cotter, D. R., & Cannon, M. (2012). Evidence for shared susceptibility to epilepsy and psychosis: A population-based family study. *Biological Psychiatry, 71*(9), 836–839. doi:10.1016/j.biopsych.2012.01.011.

Cramer, J. A., Perrine, K., Devinsky, O., Bryant-Comstock, L., Meador, T., & Hermann, B. (1998). Development and cross-cultural translations of a 31-item quality of life in epilepsy inventory. *Epilepsia, 39*(1), 81–88. doi:10.1111/j.1528-1157.1998.tb01278.x.

Cramer, J. A., Perrine, K., Devinsky, O., & Meador, K. (1996). A brief questionnaire to screen for quality of life in epilepsy: The QOLIE-10. *Epilepsia, 37*(6), 577–582. doi:10.1111/j.1528-1157.1996.tb00612.x.

Cramer, J. A., Westbrook, L. E., Devinsky, O., Perrine, K., Glassman, M. B., & Camfield, C. (1999). Development of the quality of life in epilepsy inventory for adolescents: The QOLIE-AD-48. *Epilepsia, 40*(8), 1114–1121. doi:10.1111/j.1528-1157.1999.tb00828.x.

Delaney, R. C., Rosen, A. J., Mattson, R. H., & Novelly, R. A. (1980). Memory function in focal epilepsy—a comparison of non-surgical, unilateral temporal-lobe and frontal-lobe samples. *Cortex, 16*(1), 103–117.

DiIorio, C., Shafer, P. O., Letz, R., Henry, T., Schomer, D. L., Yeager, K., et al. (2003). The association of stigma with self-management and perceptions of health care among adults with epilepsy. *Epilepsy & Behavior, 4*(3), 259–267. doi:10.1016/S1525-5050(03)00103-3.

Dikmen, S., Matthews, C. G., & Harley, J. P. (1977). Effect of early versus late onset of major motor epilepsy on cognitive-intellectual performance: Further considerations. *Epilepsia, 18*(1), 31–36.

Dodrill, C. B., Batzel, L. W., Queisser, H. R., & Temkin, N. R. (1980). An objective method for the assessment of psychological and social-problems among epileptics. *Epilepsia, 21*(2), 123–135. doi:10.1111/j.1528-1157.1980.tb04053.x.

Elliott, I. M., Lach, L., & Smith, M. L. (2005). I just want to be normal: A qualitative study exploring how children and adolescents view the impact of intractable epilepsy on their quality of life. *Epilepsy & Behavior, 7*(4), 664–678. doi:10.1016/j.yebeh.2005.07.004.

Espie, C. A., Watkins, J., Duncan, R., Espie, A., Sterrick, M., Brodie, M. J., et al. (2001). Development and validation of the Glasgow epilepsy outcome scale (GEOS): A new instrument for measuring concerns about epilepsy in people with mental retardation. *Epilepsia, 42*(8), 1043–1051. doi:10.1046/j.1528-1157.2001.0420081043.x.

Fernandes, P. T., Salgado, P. C. B., Noronha, A. L. A., Barbosa, F. D., Souza, E. A. P., Sander, J. W., et al. (2007). Prejudice towards chronic diseases: Comparison among epilepsy, AIDS and diabetes. *Seizure-European Journal of Epilepsy, 16*(4), 320–323. doi:10.1016/j.seizure.2007.01.008.

Fiszman, A., Alves-Leon, S. V., Nunes, R. G., D'Andrea, I., & Figueira, I. (2004). Traumatic events and posttraumatic stress disorder in patients with psychogenic nonepileptic seizures: A critical review. *Epilepsy and Behavior, 5*(6), 818–825. doi:10.1016/j.yebeh.2004.09.002.

Gershon, R. C., Lai, J. S., Bode, R., Choi, S., Moy, C., Bleck, T., et al. (2012). Neuro-QOL: Quality of life item banks for adults with neurological disorders: Item development and calibrations based upon clinical and general population testing. *Quality of Life Research, 21*(3), 475–486. doi:10.1007/s11136-011-9958-8.

Gillham, R., Baker, G., Thompson, P., Birbeck, K., McGuire, A., Tomlinson, L., et al. (1996). Standardisation of a self-report questionnaire for use in evaluating cognitive, affective and behavioural side-effects of anti-epileptic drug treatments. *Epilepsy Research, 24*(1), 47–55. doi:10.1016/0920-1211(95)00102-6.

Gillham, R., Bryant-Comstock, L., & Kane, K. (2000). Validation of the side effect and life satisfaction (SEALS) inventory. *Seizure, 9*(7), 458–463. doi:10.1053/seiz.2000.0446.

Giovagnoli, A. R., da Silva, A. M., Federico, A., & Cornelio, F. (2009). On the personal facets of quality of life in chronic neurological disorders. *Behavioural Neurology, 21*(3-4), 155–163. doi:10.3233/Ben-2009-0243.

Gloag, D. (1985). Epilepsy and employment. *British Medical Journal, 291*(6487), 2–3.

Goldstein, L. H., Chalder, T., Chigwedere, C., Khondoker, M. R., Moriarty, J., Toone, B. K., et al. (2010). Cognitive-behavioral therapy for psychogenic nonepileptic seizures: A pilot RCT. *Neurology, 74*(24), 1986–1994. doi:10.1212/WNL.0b013e3181e39658.

Grant, A. C., Prus, N., & Nakhutina, L. (2013). Factors affecting quality of life in epilepsy in a multi-ethnic urban population. *Epilepsy and Behavior, 27*(2), 283–285. doi:10.1016/j.yebeh.2013.01.031.

Harden, C. L., Hopp, J., Ting, T. Y., Pennell, P. B., French, J. A., Allen Hauser, W., et al. (2009). Management issues for women with epilepsy-Focus on pregnancy (an evidence-based review): I. Obstetrical complications and change in seizure frequency: Report of the Quality Standards Subcommittee and Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology and the American Epilepsy Society. *Epilepsia, 50*(5), 1229–1236. doi:10.1111/j.1528-1167.2009.02128.x.

Hays, R. D., Sherbourne, C. D., & Mazel, R. M. (1993). The rand 36-item health survey 1.0. *Health Economics, 2*(3), 217–227.

Helde, G., Bovim, G., Brathen, G., & Brodtkorb, E. (2005). A structured, nurse-led intervention program improves quality of life in patients with epilepsy: A randomized, controlled trial. *Epilepsy & Behavior, 7*(3), 451–457. doi:10.1016/j.yebeh.2005.06.008.

Helgeson, D. C., Mittan, R., Tan, S. Y., & Chayasirisobhon, S. (1990). Sepulveda epilepsy education—the efficacy of a psychoeducational treatment program in treating medical and psychosocial-aspects of epilepsy. *Epilepsia, 31*(1), 75–82. doi:10.1111/j.1528-1157.1990.tb05363.x.

Hermann, B. P., & Riel, P. (1981). Interictal personality and behavioral traits in temporal-lobe and generalized epilepsy. *Cortex, 17*(1), 125–128.

Hilger, E., Zimprich, F., Jung, R., Pataraia, E., Baumgartner, C., & Bonelli, S. (2013). Postictal psychosis in temporal lobe epilepsy: A case-control study. *European Journal of Neurology, 20*(6), 955–961. doi:10.1111/ene.12125.

Hills, M. D., & Baker, P. G. (1992). Relationships among epilepsy, social stigma, self-esteem, and social support. *Journal of Epilepsy, 5*(4), 231–238. doi:10.1016/S0896-6974(05)80122-7.

Hirtz, D., Thurman, D. J., Gwinn-Hardy, K., Mohamed, M., Chaudhuri, A. R., & Zalutsky, R. (2007). How common are the "common" neurologic disorders? *Neurology, 68*(5), 326–337. doi:10.1212/01.wnl.0000252807.38124.a3.

Hoppe, C., & Elger, C. E. (2011). Depression in epilepsy: A critical review from a clinical perspective. *Nature Reviews Neurology, 7*(8), 462–472. doi:10.1038/nrneurol.2011.104.

Ito, M., Okazaki, M., Takahashi, S., Muramatsu, R., Kato, M., & Onuma, T. (2007). Subacute postictal aggression in patients with epilepsy. *Epilepsy & Behavior, 10*(4), 611–614. doi:10.1016/j.yebeh.2007.02.016.

Jacoby, A., Baker, G. A., Crossley, J., & Schachter, S. (2013). Tools for assessing quality of life in epilepsy patients. *Expert Review of Neurotherapeutics, 13*(12), 1355–1369. doi:10.1586/14737175.2013.850032.

Jacoby, A., Baker, G., Smith, D., Dewey, M., & Chadwick, D. (1993). Measuring the impact of epilepsy—the development of a novel scale. *Epilepsy Research, 16*(1), 83–88. doi:10.1016/0920-1211(93)90042-6.

Jacoby, A., Gorry, J., Gamble, C., & Baker, T. A. (2004). Public knowledge, private grief: A study of public attitudes to epilepsy in the United Kingdom and implications for stigma. *Epilepsia, 45*(11), 1405–1415. doi:10.1111/j.0013-9580.2004.02904.x.

Jakovljevic, V., & Martinovic, Z. (2006). Social competence of children and adolescents with epilepsy. *Seizure, 15*(7), 528–532. doi:10.1016/j.seizure.2006.06.005.

Jenkinson, C., Wright, L., & Coulter, A. (1993). *Quality of life measurement in health care: A review of measures, and population norms for the UK SF-36*. Oxford: Horgan Print Partnership.

Jochheim, K. A. (1980). International classification of impairments, disabilities, and handicaps—a manual of classification relating to the consequences of disease—who. *International Journal of Rehabilitation Research, 3*(4), 606–606.

Kerr, C., Nixon, A., & Angalakuditi, M. (2011). The impact of epilepsy on children and adult patients' lives: Development of a conceptual model from qualitative literature. *Seizure, 20*(10), 764–774. doi:10.1016/j.seizure.2011.07.007.

Leone, M. A., Beghi, E., Righini, C., Apolone, G., & Mosconi, P. (2005). Epilepsy and quality of life in adults: A review of instruments. *Epilepsy Research, 66*(1–3), 23–44. doi:10.1016/j.eplepsyres.2005.02.009.

Loring, D. W., Marino, S., & Meador, K. J. (2007). Neuropsychological and behavioral effects of antiepilepsy drugs. *Neuropsychology Review, 17*(4), 413–425. doi:10.1007/s11065-007-9043-9.

Mayes, B. N. (2009). Review: People with epilepsy have higher risk of death by drowning than the general population. *Evidence-Based Medicine, 14*(1), 21. doi:10.1136/ebm.14.1.21.

McEwan, M. J., Espie, C. A., Metcalfe, J., Brodie, M. J., & Wilson, M. T. (2004). Quality of life and psychosocial development in adolescents with epilepsy: A qualitative investigation using focus group methods. *Seizure, 13*(1), 15–31.

McEwan, M. J., Espie, C. A., & Metcalfe, J. (2004). A systematic review of the contribution of qualitative research to the study of quality of life in children and adolescents with epilepsy. *Seizure-European Journal of Epilepsy, 13*(1), 3–14. doi:10.1016/S1059-1311(03)00081-5.

Milner, B. (1972). Disorders of learning and memory after temporal lobe lesions in man. *Clinical Neurosurgery, 19*, 421–446.

Morrell, M. J., Sperling, M. R., Stecker, M., & Dichter, M. A. (1994). Sexual dysfunction in partial epilepsy—a deficit in physiological sexual arousal. *Neurology, 44*(2), 243–247.

Neal, E. G., Chaffe, H., Schwartz, R. H., Lawson, M. S., Edwards, N., Fitzsimmons, G., et al. (2008). The ketogenic diet for the treatment of childhood epilepsy: A randomised controlled trial. *Lancet Neurology, 7*(6), 500–506. doi:10.1016/S1474-4422(08)70092-9.

Nelson, E. C., Landgraf, J. M., Hays, R. D., Wasson, J. H., & Kirk, J. W. (1990). The functional status of patients—how can it be measured in physicians offices. *Medical Care, 28*(12), 1111–1126. doi:10.1097/00005650-199012000-00001.

Novotna, I., & Rektor, I. (2002). The trend in public attitudes in the Czech Republic towards persons with epilepsy. *European Journal of Neurology, 9*(5), 535–540. doi:10.1046/j.1468-1331.2002.00466.x.

O'Donoghue, M. F., Duncan, J. S., & Sander, J. W. A. S. (1998). The subjective handicap of epilepsy—a new approach to measuring treatment outcome. *Brain, 121*, 317–343. doi:10.1093/brain/121.2.317.

Pearlin, L. I., & Schooler, C. (1978). Structure of coping. *Journal of Health and Social Behavior, 19*(1), 2–21. doi:10.2307/2136319.

Post, R. M., & Weiss, S. R. B. (1996). A speculative model of affective illness cyclicity based on patterns of drug tolerance observed in amygdala-kindled seizures. *Molecular Neurobiology, 13*(1), 33–60. doi:10.1007/Bf02740751.

Rai, D., Kerr, M. P., McManus, S., Jordanova, V., Lewis, G., & Brugha, T. S. (2012). Epilepsy and psychiatric comorbidity: A nationally representative population-based study. *Epilepsia, 53*(6), 1095–1103. doi:10.1111/j.1528-1167.2012.03500.x.

Reuber, M., Fernandez, G., Bauer, J., Helmstaedter, C., & Elger, C. E. (2002). Diagnostic delay in psychogenic nonepileptic seizures. *Neurology, 58*(3), 493–495.

Sabaz, M., Cairns, D. R., Lawson, J. A., Nheu, N., Bleasel, A. F., & Bye, A. M. E. (2000). Validation of a new quality of life measure for children with epilepsy. *Epilepsia, 41*(6), 765–774. doi:10.1111/j.1528-1157.2000.tb00240.x.

Sabaz, M., Lawson, J. A., Cairns, D. R., Duchowny, M. S., Resnick, T. J., Dean, P. M., et al. (2003). Validation of the quality of life in childhood epilepsy questionnaire in American epilepsy patients. *Epilepsy & Behavior, 4*(6), 680–691. doi:10.1016/j.yebeh.2003.08.012.

Sabbagh, S. E., Soria, C., Escolano, S., Bulteau, C., & Dellatolas, G. (2006). Impact of epilepsy characteristics and behavioral problems on school placement in children. *Epilepsy and Behavior, 9*(4), 573–578. doi:10.1016/j.yebeh.2006.08.004.

Sackett, D. L., Chambers, L. W., Macpherson, A. S., Psych, D., Goldsmith, C. H., & Mcauley, R. G. (1977). Development and application of indexes of health—general methods and a summary of results. *American Journal of Public Health, 67*(5), 423–428. doi:10.2105/Ajph.67.5.423.

Shinnar, S., & Pellock, J. M. (2002). Update on the epidemiology and prognosis of pediatric epilepsy. *Journal of Child Neurology, 17*, S4–S17. doi:10.1177/08830738020170010201.

Shore, C. P., Perkins, S. M., & Austin, J. K. (2008). The seizures and epilepsy education (SEE) program for families of children with epilepsy: A preliminary study. *Epilepsy & Behavior, 12*(1), 157–164. doi:10.1016/j.yebeh.2007.10.001.

Smeets, V. M. J., van Lierop, B. A. G., Vanhoutvin, J. P. G., Aldenkamp, A. P., & Nijhuis, F. J. N. (2007). Epilepsy and employment: Literature review. *Epilepsy & Behavior, 10*(3), 354–362. doi:10.1016/j.yebeh.2007.02.006.

Spatt, J., Bauer, G., Baumgartner, C., Feucht, M., Graf, M., Mamoli, B., et al. (2005). Predictors for negative attitudes toward subjects with epilepsy: A representative survey in the general public in Austria. *Epilepsia, 46*(5), 736–742. doi:10.1111/j.1528-1167.2005.52404.x.

Speechley, K. N., Ferro, M. A., Camfield, C. S., Huang, W., Levin, S. D., Smith, M. L., et al. (2012). Quality of life in children with new-onset epilepsy: A 2-year prospective cohort study. *Neurology, 79*(15), 1548–1555. doi:10.1212/WNL.0b013e31826e25aa.

Spitz, M. C., Towbin, J. A., Shantz, D., & Adler, L. E. (1994). Risk factors for burns as a consequence of seizures in persons with epilepsy. *Epilepsia, 35*(4), 764–767.

Stevens, J. R. (1999). Epilepsy, schizophrenia, and the extended amygdala. *Advancing from the Ventral Striatum to the Extended Amygdala, 877*, 548–561. doi:10.1111/j.1749-6632.1999.tb09288.x.

Tan, G., Thornby, J., Hammond, D. C., Strehl, U., Canady, B., Arnemann, K., et al. (2009). Meta-analysis of EEG biofeedback in treating epilepsy. *Clinical EEG and Neuroscience, 40*(3), 173–179.

Tellez-Zenteno, J. F., Patten, S. B., Jette, N., Williams, J., & Wiebe, S. (2007). Psychiatric comorbidity in epilepsy: A population-based analysis. *Epilepsia, 48*(12), 2336–2344.

Townshend, K. H., Dorris, L., McEwan, M. J., Aylett, S. E., Brodie, M. J., O'Regan, M., et al. (2008). Development and validation of a measure of the impact of epilepsy on a young person's quality of life: Glasgow epilepsy outcome scale for young persons (GEOS-YP). *Epilepsy and Behavior, 12*(1), 115–123. doi:10.1016/j.yebeh.2007.09.008.

Trevorrow, T. (2006). Air travel and seizure frequency for individuals with epilepsy. *Seizure, 15*(5), 320–327. doi:10.1016/j.seizure.2006.03.006.

Vickrey, B. G. (1993). A procedure for developing a quality-of-life measure for epilepsy surgery patients. *Epilepsia, 34*(Suppl 4), S22–27.

Vickrey, B. G., Hays, R. D., Graber, J., Rausch, R., Engel, J., Jr., & Brook, R. H. (1992). A health-related quality of life instrument for patients evaluated for epilepsy surgery. *Medical Care, 30*(4), 299–319.

Viikinsalo, M., Gilliam, F., Faught, E., & Kuzniecky, R. (1997). Development of the EFA concerns index: A patient-based measure of the effects of epilepsy. *Epilepsia, 38*(Suppl 8), 241–242.

Wagner, A. K., Keller, S. D., Kosinski, M., Baker, G. A., Jacoby, A., Hsu, M. A., et al. (1995). Advances in methods for assessing the impact of epilepsy and antiepileptic drug-therapy on patients health-related quality-of-life. *Quality of Life Research, 4*(2), 115–134. doi:10.1007/Bf01833606.

Wagner, J. L., Smith, G., Ferguson, P., van Bakergem, K., & Hrisko, S. (2010). Pilot study of an integrated cognitive-behavioral and self-management intervention for youth with epilepsy and caregivers: Coping openly and personally with epilepsy (COPE). *Epilepsy & Behavior, 18*(3), 280–285. doi:10.1016/j.yebeh.2010.04.019.

Ware, J. E., Jr., Kosinski, M., Bayliss, M. S., McHorney, C. A., Rogers, W. H., & Raczek, A. (1995). Comparison of methods for the scoring and statistical analysis of SF-36 health profile and summary measures: Summary of results from the medical outcomes study. *Medical Care, 33*(4 Suppl), AS264–279.

Whitman, S., Hermann, B. P., & Gordon, A. C. (1984). Psychopathology in epilepsy—how great is the risk. *Biological Psychiatry, 19*(2), 213–236.

Wiebe, S., Bellhouse, D. R., Fallahay, C., & Eliasziw, M. (1999). Burden of epilepsy: The Ontario health survey. *Canadian Journal of Neurological Sciences, 26*(4), 263–270.

Yerby, M. S. (2000). Quality of life, epilepsy advances, and the evolving role of anticonvulsants in women with epilepsy. *Neurology, 55*(5), S21–S31.

Yerby, M. S., Kaplan, P., & Tran, T. (2004). Risks and management of pregnancy in women with epilepsy. *Cleveland Clinic Journal of Medicine, 71*(Suppl 2), S25–37.