ORIGINAL

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COURT OF CLAIMS
OF OHIO

IN THE COURT OF CLAIMS OF OHIO

2015 APR 28 PM 1:26

BRYAN A. HUFF,	:	
	:	
Plaintiff,	:	
	:	
v.	:	Case No. 2014-00468
	:	
STATE OF OHIO [The Ohio State University Medical Center],	:	
	:	
Defendant.	:	

IDENTIFICATION OF EXPERT WITNESSES AND NOTICE OF FILING EXPERT REPORTS BY DEFENDANT THE OHIO STATE UNIVERSITY WEXNER MEDICAL CENTER

Pursuant to the Court's *Entry* filed August 28, 2014, Defendant The Ohio State University Medical Center ("Defendant") identifies the follow expert witnesses and attaches copies of their reports:

1. Bradford B. Mullin, M.D., FAANS, FACS
   Central Ohio Neurological Surgeons
   955 Eastwind Drive
   Westerville, Ohio 43081

   A copy of Dr. Mullin's report dated April 17, 2015 is attached hereto at Tab A.

2. Richard T. Katz, M.D.
   Washington University School of Medicine
   4660 Maryland Drive, Suite 250
   St. Louis, Missouri 63108

   A copy of Dr. Katz's report dated April 12, 2015 is attached hereto at Tab B, and a copy of his addendum report dated April 21, 2015 is attached hereto at Tab C.

Defendant also reserves the right to elicit expert testimony at trial from Bryan Huff's treating and evaluating physicians, as identified in the medical records that have been produced in this case, and will timely amend this disclosure after discovery has been completed as to the specific treating and evaluating physicians it will call at trial.

ON COMPUTER

Theodore P. Mattis (0055229)
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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and complete copy of the foregoing Identification of Experts and with attached reports was served upon Plaintiff's attorney, Kenneth S. Blumenthal, Rourke & Blumenthal, 495 South High Street, Suite 450, Columbus, Ohio 43215, by regular U.S. mail, postage prepaid, this 28th day of April 2015.

Theodore P. Mattis

CENTRAL OHIO NEUROLOGICAL SURGEONS

Bradford B. Mullin, M.D., F.A.C.S. - 868-5872
William R. Zerick, M.D. - 268-0105
Robert J. Gewirtz, M.D., F.A.C.S. - 261-0393

Emeritus
Edward S. Sadar, M.D.
Thomas J. Hawk, M.D.
David Yashon, M.D.
William R. Kemp, M.D.

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A

April 17, 2015

RE: BRYAN A. HUFF (DOB: 7/19/69)

Mr. Huff presented to me on March 3, 2015, for the purpose of an **independent medical exam.**

RECORDS REVIEWED:

- Index to Medical Record
- OSU Huff Medical Records
- Supplemental OSU Medical Records (2013 – 2014)
- Rehab & Life Care Plan by Dr. Burke
- Estimates of Present Value of LCP by Boyd
- IME by Dr. Miller (9/11/2014)
- Heartland of Marietta/HRC Manor Care
- Dodd Hall Medical Records
- Records of the OSU Comprehensive Spine Center
- Records of Dr. Francis Farhadi

HISTORY OF PRESENT ILLNESS: Mr. Huff is a 45-year-old male who states he has no feeling below his nipple line. He has an open wound on his lower back. Because he has no sensation no local anesthesia is necessary when undergoing procedures to treat the wound.

He describes diplopia, which has been present since the day after surgery.

He is able to swallow but chokes easily.

He self-catheterizes himself but states he cannot feel the catheter slide into his penis; however, it tends to hit something when it almost gets to his bladder. He feels this is related to his prostate. He does not feel the sensation to urinate.

He gives himself enemas for his bowels and has a little bit of sensation at the rectum.

He states he is unable to move his hips and has no motor function below his hips.

NEUROLOGIC EXAMINATION: Mr. Huff presented in a wheelchair. He is awake, alert, pleasant and conversant. He has normal mentation and normal speech. Blood pressure is 144/97, pulse of 83, and temperature 99.1.

His extraocular muscles are intact. His pupils are equal and reactive with respect to light and accommodation. On testing with tuning fork, he has good hearing in both ears. His Weber test is symmetric.

His tongue protrudes midline. His face is symmetric. His palate moves in the midline.

To motor testing, he has a little bit of giveaway strength in his right shoulder but he attributes that to pain. Otherwise in his right upper extremity he has 5/5 strength in the bicep, triceps, fingers extensors and grip strength. He has a negative Hoffman sign on the right. On the left side, he has 5/5 strength in his deltoid, bicep and triceps, but a 4/5 strength in his grip, 4-/5 strength in his left finger extensors. He has a negative Hoffman sign.

He states that he now has bilateral numbness in his arms and hands and they are symmetric.

To sensory testing, he has a sensory level above his nipple line; I would place it approximately T3-T4, and he is insensate to pinprick testing below that level.

He has a closed wound in his left abdomen. He has an open wound in his back that is packed.

He has a mottling discoloration to his lower extremities. I find him to have 0/5 strength in his hip flexors, knee extensors, foot dorsiflexion and plantar flexion. There is a negative clonus, negative Babinski. He has 1+ reflexes in his biceps, triceps and brachioradialis. I could not elicit knee or ankle jerk reflexes bilaterally.

IMPRESSION: Mr. Huff presents as a T4 paraplegic. He does have some weakness in his left hand but his hands are functional bilaterally. He has some dexterity changes in his fingers. He also has pain in his right shoulder.

I believe functionally he is a T4 paraplegic, however, his disabilities cannot all be related to the surgery of 02/22/2013.

ASSESSMENT: The patient had a significant amount of disabling problems prior to the surgery of 02/22/2013. He had a history of bowel and bladder dysfunction including bladder incontinence (dating to 2008). He had low back and leg pain (dating back to 2006), impairing his ambulatory abilities. He had failed multiple previous low back surgeries and was noted to have arachnoiditis on 10/19/2012. Arachnoiditis is known to significantly impair neural function and is often responsible for radicular pain and numbness. He also had bilateral avascular necrosis of his hips requiring hip replacement which is not related to the surgery of 02/22/2013.

Sagittal realignment surgery is known to have a high complication rate. Improvement in function, low back pain and radicular pain is expected to be partial. Functional improvement via measures such as the ODI is known to improve 35-55% at best. There is at least a 30-40% chance there will be no improvement in low back pain.

Therefore, it is likely that many of these impairments would have likely impaired him even if his alignment surgery had not been complicated by an air embolism because of his arachnoiditis and longstanding radiculopathy, he would have continued to have disabling leg pain. In fact, this type of surgery doesn't really intend to address leg pain. His bilateral avascular necrosis would also have caused continued hip pain, limiting his ambulatory abilities. His T4 sensory level will decrease his overall pain burden going forward. His pain tracts in the spinal cord are impaired and cannot transmit the pain signals to his brain. To my exam and by his response, he is anesthetic from T4 down, involving his lower thoracic spin, lumbar spine and legs. This will decrease his pain medicine requirement.

His upper extremity function appears to have returned to nearly normal on my exam with the exception of some hand numbness and mild weakness.

He had significant psychological problems predating the 02/22/2013 surgery. He was diagnosed with depressive disorder, panic disorder, agraphia, personality disorder, PTSD and major depressive disorder. He was known to have had fifty suicide attempts, alcohol and nicotine abuse prior to the surgery. I would agree that neuropsychological testing would give a more detailed assessment but his interactions during the interview were grossly normal. There is also a history of concussion on 01/05/2011. His diplopia does not appear to have predated the 02/22/2013 surgery. He is also noted to have multiple comorbidities that preceded the surgery of 02/22/2013. These include COPD, asthma, GERD and hypertension.

FUTURE PLAN OF CARE ASSESSMENT: I have reviewed the life care plan prepared by Dr. William Burke, PhD and the opinion of Dr. Carole Miller.

While I agree he will need ongoing medical care, some of the assertions are uncertain. It is unclear his Baclofen pump will need multiple reimplantations. Also tolerance to Baclofen may make it lose its effectiveness.

The plan allows for a PM&R exam two times per year. Realistically this will probably be on a prn basis.

Renal testing with ultrasound one time per year will be the primary test of choice. KUB's are of uncertain usefulness when following renal disease.

Only a portion of his psychological and psychiatric needs can be related to the surgery. The majority of the psychological diseases predated the surgery of 02/22/2013.

Coumadin is rapidly being replaced by newer agents that do not require PT/INR monitoring so the blood tests will likely be unnecessary, and so will the RN fee for blood draws.

I do not see where LFT, PTH and vitamin D testing will be necessary on a routine basis. The DEXA scan would be on an as needed basis.

It would be my opinion that outpatient therapy would be a better modality than a short stint of inpatient therapy. In this way, I think the dollars allocated to therapy can be used for a longer time. I think longer term outpatient physical therapy is much more likely to give him meaningful long-term benefit. He will reach maximal improvement and will need to maintain his status via exercise. His outpatient course can be accomplished by PT, three times a week for six weeks.

His hip issues are unrelated to his surgery of 2/22/13. Therefore, an orthopedic evaluation is unrelated to the surgery.

Mr. Huff does have a neurogenic bladder. This can partially be related to his surgery of 2/22/13 but not entirely. His records indicate that he had bladder and

bowel dysfunction predating the surgery of 2/22/13. Therefore the urology and general surgery evaluations cannot be entirely related to his surgery. He would likely have had incontinency and bowel dysfunction even if he did not have the 2/22/13 surgery.

Sincerely,

Bradford B. Mullin, M.D., FAANS, FACS
Director, Division of Neurosurgery Mt. Carmel East
Adjunct Clinical Assistant Professor – OSU Neurosurgery

BBM/kam
Dictated but not read by the doctor.
D: 04/11/15 T: 04/17/15

B

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Name: Bryan Huff
DOB: 7/19/69

April 12, 2015

This is a cumulative note of all records in this office to date.

The file was reviewed at the behest of Ms. Kim Lewis of Vorys et al. The file is entitled Bryan Huff v. OSU Wexner Medical Center. I have been asked to prepare a preliminary life care plan prior to my examination of the patient. I reserve the right to revise this plan upon performing my own IME.

History of Present Illness

Pertinent History

- On 2/21/13 Mr. Huff was admitted to the OSU Medical Center by Dr. Farhadi
- On 2/22/13 he underwent surgical repair of the lumbar spine secondary to the acquired deformity (scoliosis)
    - Laminotomies and foraminotomies L1-L5
    - L1-4 osteotomies
    - Removal of L34 hardware
    - T11-iliac fusion with rods
    - L3 subtraction osteotomy
- Air embolism suspected at end of case
    - Acute hypotension

Reported Diagnoses

- Ischemic myelopathy
- Ischemic stroke
    - Acute embolic infarcts of brain
- Incomplete tetraplegia
- Respiratory distress
- Pulmonary emboli
- Bilateral pleural effusions
- Myocardial infarction
    - Anterolateral wall

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Tests

- Cardiac catheterization
    - Normal coronary arteries
    - EF 45%

Treatments

- ICU management
- Hyperbaric oxygen
- Ventilation
- Anticoagulation therapy

He was transferred for rehabilitation on 3/12/13. At the time of discharge:

- Ambulating short distances with a wheeled walker
- Independent with upper body activities of daily living
- Assistance with lower body care

He was transferred to Heartland of Marietta. On 12/16/13 he moved into a mobile home in Marietta.

Present Issues

- Tetraparesis
    - Aphasia
    - Right arm more affected
    - Complete sensory loss below T4
    - Upper extremities presently unimpaired
    - Extended physical therapy
    - Non ambulatory
    - Power wheelchair
- Ischemic stroke
- Neurogenic bowel
    - Bowel program
    - Constipation
    - Hemorrhoids

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- Neurogenic bladder
    - Intermittent catheterization
    - UTI's
- Mental health
- Atypical chest pain
    - Non-cardiac
    - Acute on chronic systolic heart failure
    - EF returned to normal
- Anticoagulation
- Sudden vision loss
    - Amaurosis fugax
- Spasticity
    - Intrathecal pump placed 3/2014
    - Narcotics switched to oral meds
- Chronic pain
    - Cervical MRI August 2013
        - Fusion for C4 to C6, slight straightening of the cervical lordosis and a C3-C4 disc osteophyte
    - Thoracic MRI
        - Degenerative changes T7-8
    - Lumbar MRI
        - Post-operative changes
    - Neurogenic pain
        - Lower extremities
- Rotator cuff tendinitis
- Sleep disorder
    - Secondary to pain
- Pumps
    - Presently has pain and intrathecal baclofen pump
    - Pump site infection
- ADL's
    - Non-ambulatory
    - Independent with wheelchair transfers but needs assistance to bed and shower
    - Maximal assist with dressing
    - Dependent for meal prep and grocery shopping, homemaking
    - Manages personal an financial affairs

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Past Medical/Surgical History

- Cervical discectomy and fusion C4-6 2000
- Chronic LBP
    - Fall 2005 in work related accident
    - L5-S1 and degenerative disc disease at L4-L5
    - Diskectomy and fusion at L4-5 and L5-S1 2006
    - Fusion at L3-4, L4-5 and L5-S1 2008
        - Removal of hardware
    - Chronic LBP
    - Intrathecal pump with Dilaudid
    - Pain management
    - EMG 2010
        - *Normal*
    - Discectomy and fusion at L3-L4 in May of 2011
    - L3-L4 exploration, duraplasty and L3 laminectomy August 2011
        - Removal of hardware
    - "Failed back syndrome"
    - Walking with a walker 10/23/12
    - "Acquired spinal deformity"
    - Narcotic management
        - Opioid dependence
    - Physically disabled prior to air embolism
- Avascular necrosis both hips
    - Steroid related?
    - Bilateral hip replacements
- Neurogenic bladder 2010
- Bowel and bladder incontinence since 2011
- GERD
- Chronic epidydimitis
- Hypotestosteronism
- Psychiatric history
    - Anxiety
    - Panic attacks
        - Panic disorder
        - Agoraphobia
    - "Difficulties with anger management"

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- Over 50 suicide attempts
- Major depressive disorder
- Borderline features
  - "Rule out personality disorder"
- Alcohol abuse
- Post-traumatic stress disorder
- Chronic pain syndrome
- Nicotine abuse
- Sexual abuse by a foster parent
- "Poor memory" noted in 2010

Review of Systems

Not taken

Family History

Not known

Allergies

Not known

Medications

Not known

Occupational History

Previously on disability

Equipment

Hospital bed
Electric wheelchair

Psychosocial History

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Extensive psychiatric history

Reports and Depositions

William Burke, PhD, prepared a LCP 8/27/14.

David Boyd, PhD, estimated the life care plan to total $4.0-4.7M.

Carole Miller, MD, neurosurgeon, performed an IME 9/11/14.

Physical Examination

Patient not yet examined

Radiographs Reviewed

None

Impression

- The patient had significant disability prior to the 2/22/13 surgery.
    - Cervical discectomy and fusion
    - Chronic low back pain with multiple surgeries
    - Intrathecal pump with Dilaudid
    - Failed back syndrome
    - Walking with a walker
    - Narcotic dependence
    - Avascular necrosis of both hips
    - Bilateral hip replacements
    - Neurogenic bladder
    - Bowel and bladder incontinence
    - Psychiatric history
        - Panic attacks
        - Agoraphobia
        - Anger management problems
        - Multiple suicide attempts
        - Personality disorder
        - Alcohol abuse

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    - Nicotine abuse
- These prior problems are augmented with paraplegia, myocardial infarction, right arm weakness, aphasia

I was asked to create a life care planning document.

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Life Care Planning

When planning the lifelong needs for a person, a life care plan (LCP) may be constructed. A LCP estimates what services likely will be needed in the future in order to meet the future needs of the patient. When constructing a LCP, the physician first must determine the extent and sequelae of the patient's physical and cognitive impairments during the course of several evaluations.

1. Determine extent and sequelae of the patient's physical and cognitive impairments
2. Estimate prognosis
3. Estimate the need for and benefit of further medical and rehabilitative interventions
4. Calculate the costs of future personal needs (e.g. wheelchairs, orthopedic equipment, home furnishings and modifications, medical supplies, and recreational equipment)

A physician experienced with LCP with a variety of neurological and musculoskeletal disabilities can give increasingly accurate estimates of the patient's prognosis. With this knowledge, one can develop a cogent plan to assess the needs and benefits of future medical treatments, surgeries, hospitalizations and rehabilitation interventions, e.g. physical therapy, occupational therapy, and speech therapy. In cases of alleged malpractice liability issues on the part of prenatal and perinatal care givers, physicians may be asked to calculate the costs of these potential interventions and personal needs.

The initial step in formulating these costs is to estimate the life expectancy of the patient. This information can be found in a wide variety of sources depending on the diagnoses involved. Second, the physician must estimate the need, duration of need, and costs for a wide variety of hardware items and services. Examples of such devices include wheelchairs, seating systems, orthopedic aids, orthotics, home furnishings, architectural modifications, aids for independent function, drugs, supplies, and leisure time equipment. The patient's future home or facility care costs can similarly be approximated by planning for the appropriate level of daily care–e.g. home aid, skilled care within the home, children's home occupant, group home, assisted care setting, nursing home setting, etc.). The life care costs must include services rendered by physical, occupational, and speech therapists, and other educational and psychological services if they are not readily available. Finally, costs for future medical and surgical care, and the costs of potential future medical complications and procedures must be appraised.

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After the total cost of a life care plan is calculated in present day dollars, a financial adjustment must be made to account for future interest rates and inflation. Such calculations need to account for the increasing costs of health care versus the consumer price index, return on investments, estimations of the present value of goods versus future costs (the discount rate), and taxes on investments. Economic modeling of these items is considered within the purview of an economist and is generally not carried out by a physician unless he or she has special expertise in financial matters.

Johnson CB, Weed RO. Life care planning process. Phys Med Rehabil Clin N Am 24:403-417, 2013.
Katz RT, Johnson CB. Life care planning and cerebral palsy. Phys Med Rehabil Clin N Am 24:491-505, 2013.
Meier RH, Choppa AJ, Johnson CB. Person with amputation and their life care plan. Phys Med Rehabil Clin N Am 24:467-489, 2013.
Parker JP, Javaher SP, Carter GT. Considerations for neuropathic pain conditions in life care planning. Phys Med Rehabil Clin N Am 24:507-520, 2013.
Steins SA, Fawber H, Yuhas SA. Person with a spinal cord injury: evolving prototype for LCP. Phys Med Rehabil Clin N Am 24:419-444, 2013.
Zasler ND, Ameis A, Riddick-Grisham SN. Life care planning after TBI. Phys Med Rehabil Clin N Am 24:445-465, 2013.

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What is the Cost of Living without Medical Illness?

When considering life care planning costs, it would be reasonable to offset "normal costs of living" had one not suffered a medical malady. St. Louis is used as an example of a mid-priced city in the United States.

Monthly costs:

Rent or Mortgage = $1500 to $2500

Health = $600 to $1200 for 4 people ($150 to $300 per person)

Education = $2000 to 3000 for two kids ($1000 to $ 1500 per kid)

Food = $600 to $1000

Transportation = $600 to $1000 ($300 to $500 per adult)

Household & miscellaneous = $500 to $ 1000

Pocket change = $400 to $ $800 ($100 to $200 per person)

Vacation = $400 to $800

Income

Lower estimate = $ 5, 600 per month or 67,200 per year
Upper estimate = $11,300 per month or 135,600 per year

http://www.mewithoutdebt.com/2010/02/how-much-does-it-cost-to-live.html

Typical Expenses for St. Louis, MO

These figures show the individual expenses that went into the living wage estimate. Their values vary by family size, composition, and the current location.

Monthly Expenses	One Adult	One Adult, One Child	Two Adults	Two Adults, One Child	Two Adults, Two Children

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Food	$237	$386	$458	$607	$756
Child Care	$0	$624	$0	$624	$1,104
Medical	$94	$186	$188	$280	$372
Housing	$572	$711	$572	$711	$711
Transportation	$278	$479	$556	$757	$958
Other	$200	$393	$400	$593	$786
Monthly After-Tax Income That's Required	$1,381	$2,779	$2,174	$3,572	$4,687
Annual After-Tax Income That's Required	$16,572	$33,348	$26,088	$42,864	$56,250
Annual Taxes	$1,423	$2,664	$2,263	$3,503	$4,497
Annual Before Tax Income That's Required	**$17,995**	**$36,012**	**$28,351**	**$46,367**	**$60,747**

http://www.livingwage.geog.psu.edu/counties/29189

Alternative models exist:

The Living Wage Calculator http://livingwage.mit.edu by Dr. Amy Glasmeier of the MIT Urban Institute

According to that table, the living wage for a single adult in St. Louis would be $8.69 an hour, or $17.45 an hour for an adult with one child, about $36,000 a year. For a family of four -- two adults and two children – the living wage would be $18.05 an hour, about $37,500 a year.

What Families Need to Get By. The 2013 Update of the Economic Policy Institute by Gould E, Wething H, Sabadish N et al. Issue Brief, July 3, 2013. www.epi.org/resources/budget

For a family of two adults and two children, the institute places the cost at $64,332 a year or $5,361 per month.

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Primer on Life Expectancy Determination

If one takes a particular group of people, e.g. white males born in 1956, life expectancy is the average number of years that the members of the group survive. This is approximately the same amount of time until 50% of the persons in the group have perished. Life Expectancy is based on life tables. The example below is from census data.

Table 1. Life table for the total population: United States, 2009

Spreadsheet version available from: ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/62_07/Table01.xls.

Age (years)	Probability of dying between ages x and $x+1$ q_x	Number surviving to age x l_x	Number dying between ages x and $x+1$ d_x	Person-years lived between ages x and $x+1$ L_x	Total number of person-years lived above age x T_x	Expectation of life at age x e_x
0–1	0.006372	100,000	637	99,444	7,846,926	78.5
1–2	0.000407	99,363	40	99,343	7,747,481	78.0
2–3	0.000274	99,322	27	99,309	7,648,139	77.0
3–4	0.000209	99,295	21	99,285	7,548,830	76.0
4–5	0.000160	99,274	16	99,266	7,449,545	75.0
5–6	0.000150	99,259	15	99,251	7,350,279	74.1

The columns of the table, from left to right, are:

x: age

q(x): probability of dying at age x. Also known as the (age-specific) risk of death. Note that q(x) = d(x)/l(x), so, for example, q(50) = 566 / 89,867 = 0.00630.

l(x), the survivorship function: the number of persons alive at age x. For example of the original 100,000 U.S. males in the hypothetical cohort, l(50) = 89,867 (or 89.867%) live to age 50.

d(x): number of deaths in the interval (x,x+1) for persons alive at age x. Thus of the l(50)=89,867 persons alive at age 50, d(50) = 566 died prior to age 51.

L(x): total number of **person-years** lived by the cohort from age x to x+1. This is the sum of the years lived by the l(x+1) persons who survive the interval, and the d(x) persons who die during the interval. The former contribute exactly 1 year each, while the latter contribute, on average, approximately half a year.

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T(x): total number of person-years lived by the cohort from age x until all members of the cohort have died. This is the sum of numbers in the L(x) column from age x to the last row in the table.

e(x): the (remaining) **life expectancy** of persons alive at age x, computed as e(x) = T(x)/l(x). For example, at age 50, the life expectancy is e(50) = T(50)/l(50) = 2,370,099/89,867 = 26.4.

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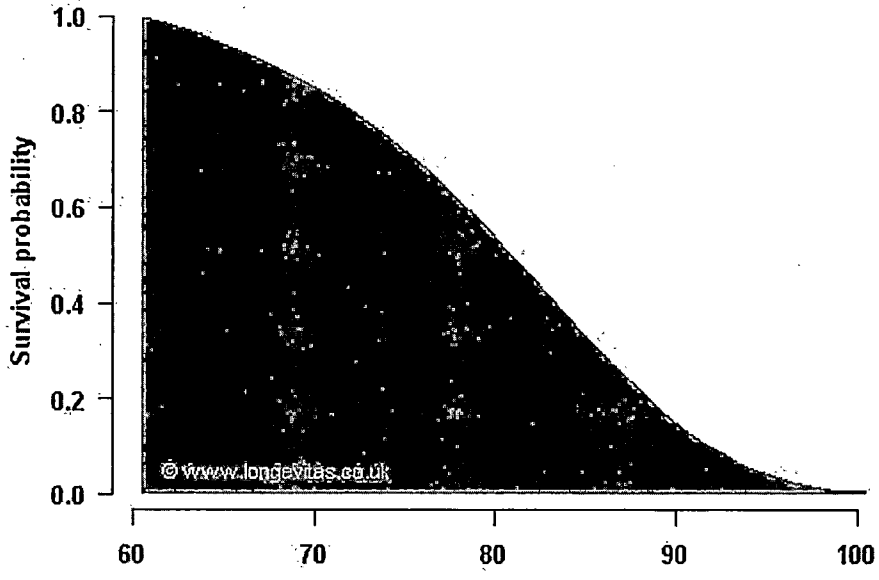
Based on such data one can draw survival curves.



The following chart shows the life expectancy for persons born in the United States by age and race. Notable is that females survive longer than males, and white persons longer than black. Hispanics have approximately the same survival as whites.

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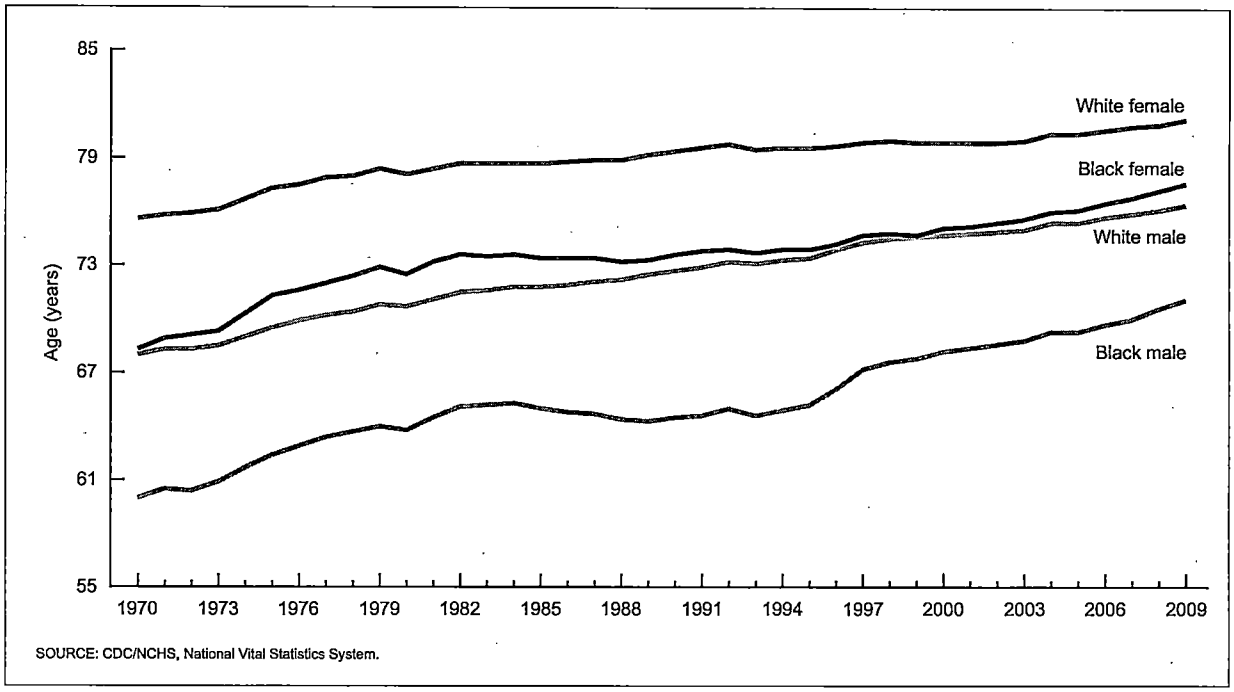

Figure 1. Life expectancy at birth, by race and sex: United States, 1970–2009

As a 45+ year old white male, the life expectancy preliminarily may be assessed by examining the US Census Data.

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Table 5. Life table for white males: United States, 2010

Spreadsheet version available from: ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Publications/NVSR/63_07/Table05.xlsx

Age	Probability of dying between ages x to x+1 q(x)	Number surviving to age x l(x)	Number dying between ages x to x+1 d(x)	Person-years lived between ages x to x+1 L(x)	Total number of person-years lived above age x T(x)	Expectation of life age x e(x)
0-1	0.01	100,000	562	99,509	7,654,399	76.5
1-2	0.00	99,438	40	99,418	7,554,890	76.0
2-3	0.00	99,398	29	99,383	7,455,472	75.0
3-4	0.00	99,369	24	99,357	7,356,089	74.0
4-5	0.00	99,345	17	99,336	7,256,732	73.0
5-6	0.00	99,328	16	99,320	7,157,395	72.1
6-7	0.00	99,313	14	99,306	7,058,075	71.1
7-8	0.00	99,299	12	99,293	6,958,769	70.1
8-9	0.00	99,287	10	99,282	6,859,477	69.1
9-10	0.00	99,277	8	99,272	6,760,195	68.1
10-11	0.00	99,268	7	99,265	6,660,923	67.1
11-12	0.00	99,261	8	99,257	6,561,658	66.1
12-13	0.00	99,253	12	99,247	6,462,401	65.1
13-14	0.00	99,241	20	99,231	6,363,154	64.1
14-15	0.00	99,222	30	99,206	6,263,922	63.1
15-16	0.00	99,191	41	99,171	6,164,716	62.1
16-17	0.00	99,150	52	99,124	6,065,545	61.2
17-18	0.00	99,098	63	99,066	5,966,421	60.2
18-19	0.00	99,035	75	98,997	5,867,355	59.2
19-20	0.00	98,959	87	98,916	5,768,358	58.3
20-21	0.00	98,872	101	98,822	5,669,443	57.3
21-22	0.00	98,771	113	98,715	5,570,621	56.4
22-23	0.00	98,658	122	98,598	5,471,906	55.5
23-24	0.00	98,537	126	98,474	5,373,309	54.5
24-25	0.00	98,411	127	98,347	5,274,835	53.6
25-26	0.00	98,284	126	98,221	5,176,487	52.7
26-27	0.00	98,158	126	98,095	5,078,267	51.7
27-28	0.00	98,031	127	97,968	4,980,172	50.8
28-29	0.00	97,905	128	97,841	4,882,204	49.9
29-30	0.00	97,777	130	97,712	4,784,363	48.9
30-31	0.00	97,647	132	97,581	4,686,651	48.0
31-32	0.00	97,515	135	97,447	4,589,070	47.1
32-33	0.00	97,380	137	97,311	4,491,623	46.1
33-34	0.00	97,242	140	97,172	4,394,312	45.2
34-35	0.00	97,102	144	97,030	4,297,140	44.3
35-36	0.00	96,958	149	96,884	4,200,109	43.3
36-37	0.00	96,810	155	96,732	4,103,225	42.4
37-38	0.00	96,655	162	96,574	4,006,493	41.5
38-39	0.00	96,492	171	96,407	3,909,919	40.5
39-40	0.00	96,321	181	96,231	3,813,512	39.6
40-41	0.00	96,140	192	96,044	3,717,281	38.7
41-42	0.00	95,948	206	95,845	3,621,237	37.7
42-43	0.00	95,742	225	95,629	3,525,392	36.8
43-44	0.00	95,517	250	95,392	3,429,763	35.9
44-45	0.00	95,267	278	95,128	3,334,371	35.0
45-46	0.00	94,989	307	94,835	3,239,243	34.1

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Thus according to this data his life expectancy is 34 years. However it is not appropriate to use only Census data when assessing life expectancy for a particular patient with a serious medical illness or disability. Why is this? It is inappropriate because the vast majority of persons in the US Census data have routine, not unusual health care problems. Thus to estimate life expectancy for this patient *accurately*, one must investigate the life expectancies for the particular diseases/conditions similar to this patient.

"As an illustration, the mean annual income in the United States is a general average. If one wants to estimate the expected annual income of a Fortune 500 chief executive officer (CEO), the general US mean is inappropriate even if all CEOs are included in the larger average. The fact that they are CEOs makes them a distinct subgroup with its own average).* Additionally, declaratory statements based on nothing more than nonsystematic data, such as from personal clinical experience should be avoided. Similarly, statements to the effect that an individual could live to a normal life expectancy or that the average of a subgroup does not apply to the individual because of alleged but not demonstrably distinguishing characteristics should not be credited, as they merely betray a misunderstanding of the very concept of life expectancy."

Vachon PJ, Sestier F. Life expectancy determination. Phys Med Rehabil Clin N Am 24:539-551, 2013.

* The median compensation of a chief executive in 2013 was $13.9 million, up 9 percent from 2012, according the Equilar 100 C.E.O. Pay Study, conducted for The New York Times.

The conditions which bear upon his life expectancy include:

- Disability
- Stroke
- MI
- SCI
- PE
- Coumadin
- Depression/personality disorder
- Alcohol abuse
- Smoking

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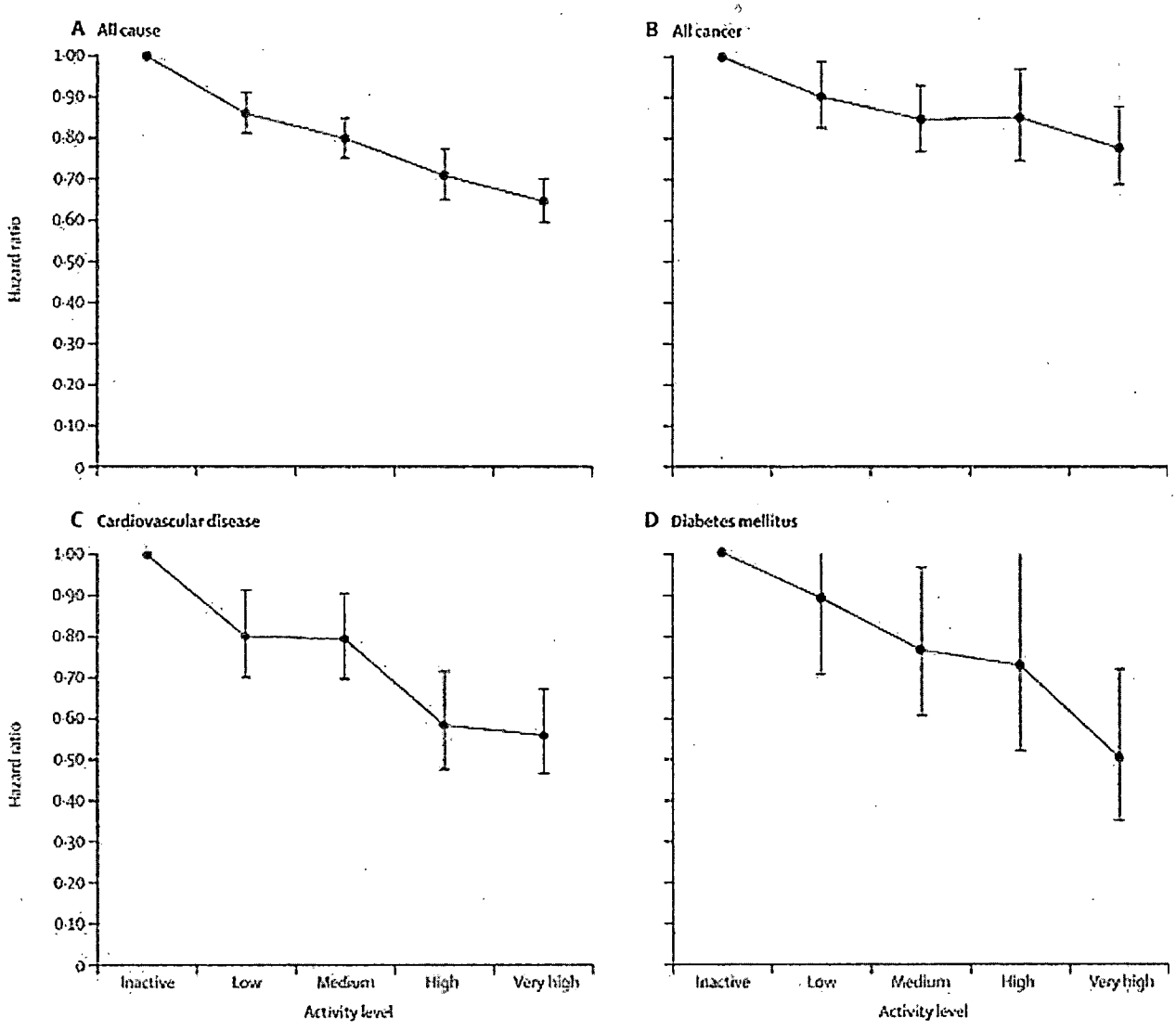
Exercise and Life Expectancy



- There is a strong relationship between activity level and life expectancy.
- 15 min a day or 90 min a week of moderate-intensity exercise might be of benefit, even for individuals at risk of cardiovascular disease.
- Synergistic with not smoking and normal BMI
- Non-leisure time physical activity is an independent predictor of longevity in older persons.

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- A meta-analysis of 33 observational studies (102,980 participants) reported the risk for all-cause mortality related to cardiorespiratory fitness (CRF). CRF, based on maximal aerobic capacity, was ranked as high (≥10.9 METs), intermediate (7.9 to 10.8 METs), or low (<7.9 METs). Participants with low CRF had an increased risk of all-cause mortality compared to those with high CRF (RR 1.7, 95% CI 1.5-1.9) and intermediate CRF (RR 1.4, 95% CI 1.3-1.5). These data indicate that measured aerobic fitness, not just reported exercise, was inversely associated with mortality risk.
- Leisure time physical activity is associated with 1.8 – 4.5 years increase in life expectancy over sedentary individuals depending on the intensity of exercise. (Moore, Janssen)
- High exercise groups were .16 times as likely to develop CV disease as non-exercisers (Dhaliwal)
- Almost ½ of adults with disabilities are physically inactive (Carroll)
- Elite athletes live longer than the general population, with a lower risk of cardiovascular disease and cancer (Garatachea)
- Sedentary time apart from physical activity is also associated with deleterious health outcomes. (Biswas)

Autenrieth CS, Baumert J, Baumeister SE et al. Association between domains of physical activity and all-cause, cardiovascular and cancer mortality. Eur J Epidemiol 26:91-99, 2011.
Biswas A, Oh PI, Faulkner GE et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults. Ann Intern Med 162:123-132, 2015.
Carroll DD, Courtney-Long EA, Stevens AC et al. Vial Signs: disability and physical activity–US, 2009-2012. MMWR Volume 63, 5/6/14.
Dhaliwal SS, Welborn T, Howat P. Recreational physical activity as an independent predictor of multivariable CV disease risk. PLOS1 8:e83435, 2013.
Garatachea N, Santos-Lozano A, Sanchis-Gomar F et al. Elite athletes live longer than the general population. Mayo Clin Proc 89:1195-1200, 2014.
Janssen I, Carson V, Lee IM. Years of life gained due to leisure time physical activity in the US. Am J Prev Med 44:23-29, 2013.
Kodama S, Saito K, Tanaka S et al. Cardiorespiratory Fitness as a Quantitative Predictor of All-Cause Mortality and Cardiovascular Events in Healthy Men and Women. JAMA 301:2024-2035, 2009.
Lin YP, Huang YH, Lu Fh et al. Non-leisure time physical activity is an independent predictor of longevity for a Taiwanese elderly population: an eight-year follow-up study. BMC Public Health 11:428, 2011.
Moore SC, Patel AV, Matthews CE et al. Leisure time physical activity of moderate to vigorous intensity and mortality. PLOS Medicine December 2012.

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Nusselder WJ, Franco OH, Peeters A et al. Living healthier for longer: comparative effects of 3 heart-healthy behaviors on life expectancy with and without cardiovascular disease. BMC Public Health 9:487, 2009.
Wen CP, Wai JPM, Tsai MK et al. Minimum amount of physical activity for reduced mortality and extended life expectancy: a prospective cohort study. Lancet 378:1202-1203, 2011.

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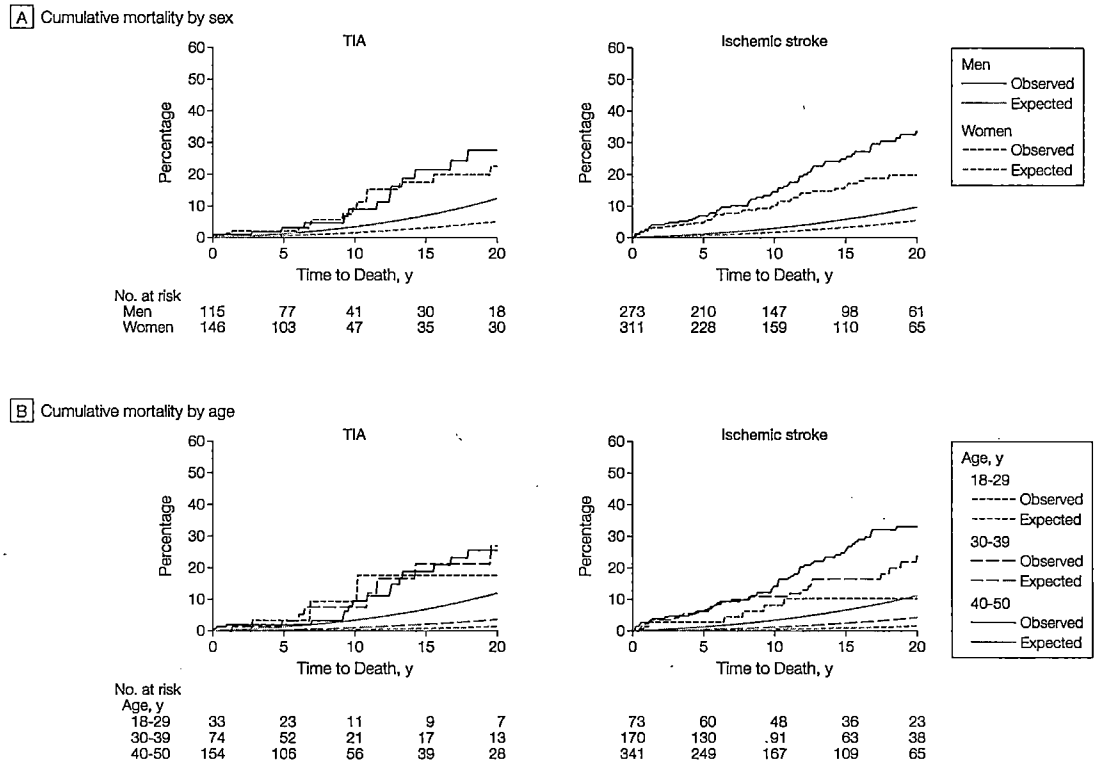
Life Expectancy for Stroke in Young Adults

- Mortality of young adults with ischemic stroke is much lower than in older patients, since survival at five years is more than 90% in the young and only 40% in the elderly (Varona).
- Among the survivors after a first-ever ischemic stroke, the main causes of death are stroke recurrence (20%– 30%), other cardiovascular events (20%–50%), malignancies (15%–35%), and infections (10%) (Varona)
- Survival depends on the # of vascular risk factors (Putaala 2012)
- Data from Rutten-Jacobs



- After a mean follow-up of 5.7 years, Naess found a mortality of almost 10%.
- Data from Putaala 2009

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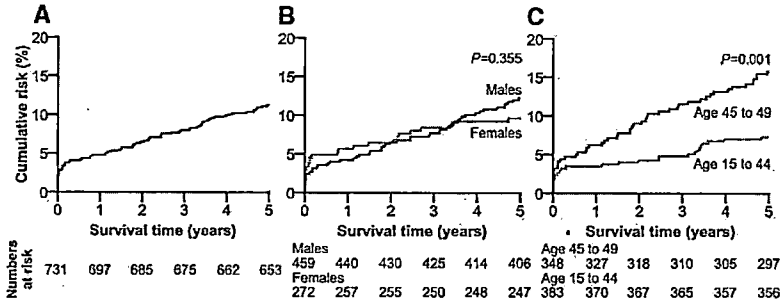

Figure 1. Kaplan–Meier estimates showing cumulative 5-year mortality risks (A) in the entire patient population and stratified by (B) gender and (C) age group.

Marini C, Tatro, R De Santis F et al. Stroke in young adults in the community-based L'Aquilla registry: incidence and prognosis. Stroke 32:52-56, 2001.
Marini C, Totaro R, Carolei A. National Research Council Study Group on Stroke in the Young. Long-term prognosis of cerebral ischemia in young adults. Stroke 30:2320-2325, 1999.
Naess H, Nyland HI, Thomassen L et al. Long-term outcome of cerebral infarction in young adults. Acta Neurol Scand 110:107-112, 2004.
Putaala J, Curtze S, Hiltunen S et al. Causes-Hardie K, Hankey GJ Jamrozik K et al. Ten year survival after first ever stroke in the Perth Community Stroke Study. Stroke 34:1842-1846, 2003.
Putaala J, Curtze S, Hiltunen S et al. Causes of death and predictors of five year mortality in young adults after first ever ischemic stroke. Stroke 40:2698-2703, 2009.
Putaala J, Haapaniemi E, Kaste M et al. How does number of risk factors affect prognosis in young patients with ischemic stroke? Stroke 43:356-361, 2012.
Ruttten-Jacobs LCA, Arntz RM, Maaijwee NA et al. Long-term mortality after stroke among adults aged 18-50 years. JAMA 309:1136-1144, 2013.
Varona JF, Bermejo F, Guerra JM, et al. Long-term prognosis of ischemic stroke in young adults. J Neurol 251:1507-1514, 2004.
Waje-Andreassen U, Naess H, Thomassen L et al. Long-term mortality among young ischemic stroke patients in western Norway. Acta Neurol Scand 116:150-156, 2007.

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Ischemic Heart Disease and Life Expectancy

- Ischemic heart disease is associated with a diminution in life expectancy. The survivors of MI have a poor prognosis, carrying a 1.5-15 fold higher risk of mortality than the rest of the population. Among survivors, 18% of men and 34% of women have a 2nd MI within 6 years. 7% of men and 6% of women die suddenly, 22% of men and 46% of women are disabled with congestive heart failure, and 8% of men and 11% of women have a stroke. Prognosis depends on LV function, arrhythmias, risk alteration, and compliance with medical therapy.
- A major recent advance has been a refined understanding of the nature of atherosclerotic plaque and the phenomenon of plaque rupture, which is the proximate cause of acute coronary syndrome (ACS) and AMI. Cardiologists now know that, in many cases (perhaps more than half), the plaque that ruptures and results in the clinical syndromes of ACS and AMI is less than 50% occlusive. These so-called vulnerable plaques, as compared with stable plaques, consist of a large lipid core and thin, fibrous caps and are subjected to greater biomechanical stress, thus leading to rupture that perpetuates thrombosis and ACS.
- Compared with men without any baseline risk factors the presence of smoking, HTN, and dyslipidemia were associated with a 10 year reduction in life expectancy. If diabetes, low employment and obesity were also present the reduction was 15 years.
- LV function is a major predictor of long term survival in patients with coronary artery disease.
- Extent and severity of CAD and LV dysfunction on cardiac catheterization are the most powerful predictors of long-term outcome.

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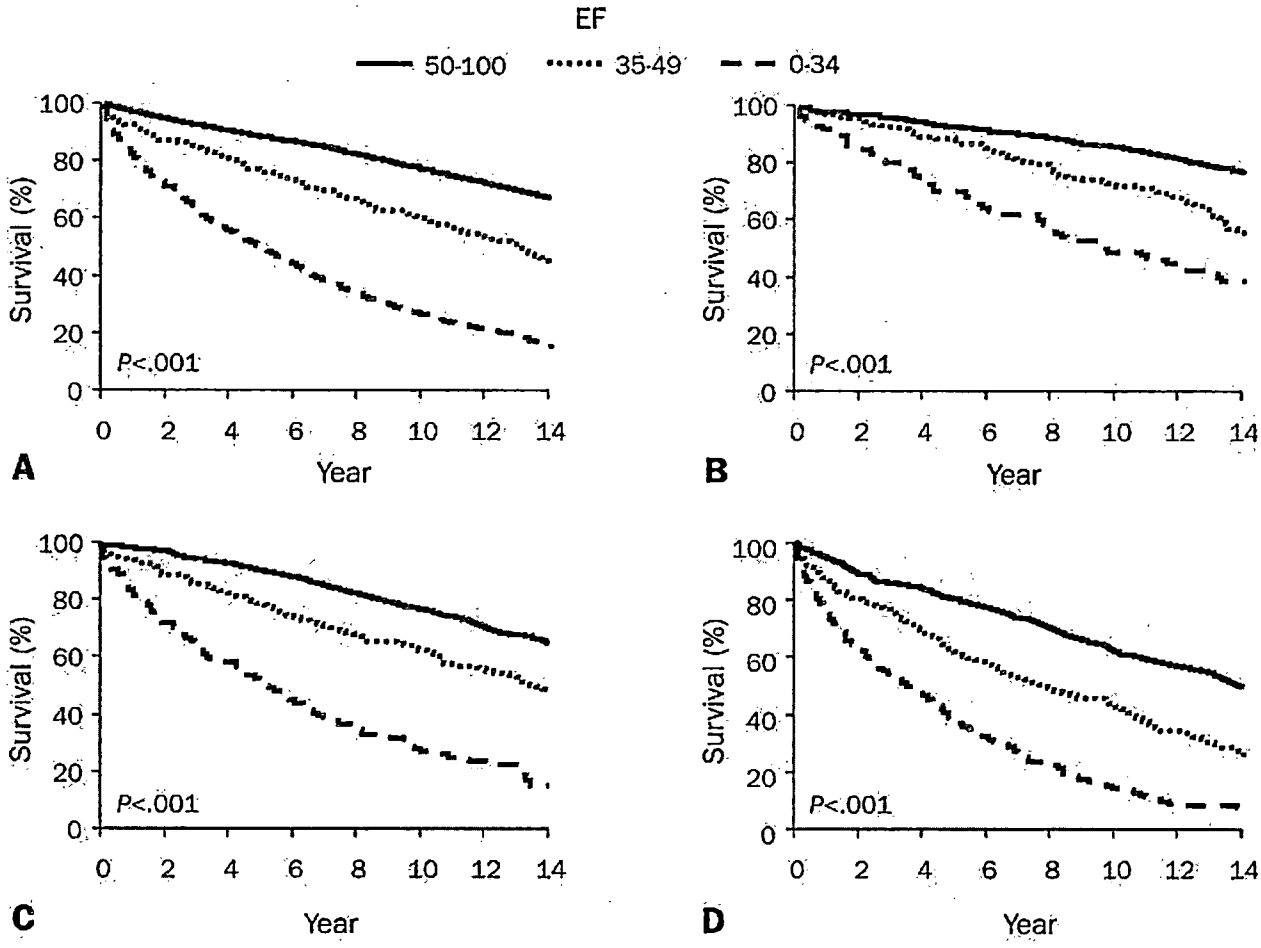

Survival of medically treated patients with coronary artery disease according to ejection fraction (EF) and number of diseased vessels. A, Patients with 1-, 2-, or 3-vessel disease by EF; B, patients with 1-vessel disease by EF; C, patients with 2-vessel disease by EF; and D, patients with 3-vessel disease by EF.

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TABLE 5. **Risk Stratification on the Basis of Noninvasive Testing**

High risk (>3% annual mortality rate)
Severe resting LV dysfunction (LVEF <35%)
High-risk treadmill score (≤−11)
Severe exercise LV dysfunction (exercise LVEF <35%)
Stress-induced large perfusion defect (particularly if anterior)
Stress-induced multiple perfusion defects of moderate size
Large, fixed perfusion defect with LV dilation or increased lung uptake (thallium-201)
Stress-induced moderate perfusion defect with LV dilation or increased lung uptake (thallium-201)
Echocardiographic wall motion abnormality (involving >2 segments) developing with low dose of dobutamine (≤10 μg/kg/min) or at a low heart rate (<120 beats/min)
Stress echocardiographic evidence of extensive ischemia
Intermediate risk (1%-3% annual mortality rate)
Mild/moderate resting LV dysfunction (LVEF, 35%-49%)
Intermediate-risk treadmill score (−10 to 4)
Stress-induced moderate perfusion defect without LV dilation or increased lung intake (thallium-201)
Limited stress echocardiographic ischemia with a wall motion abnormality only with higher doses of dobutamine involving ≤2 segments
Low risk (<1% annual mortality rate)
Low-risk treadmill score (≥5)
Normal or small myocardial perfusion defect at rest or with stress
Normal stress echocardiographic wall motion or no change of limited resting wall motion abnormalities during stress

LV = left ventricular; LVEF = LV ejection fraction.
From the American College of Cardiology/American Heart Association guidelines,[11] with permission from Wolters Kluwer Health.

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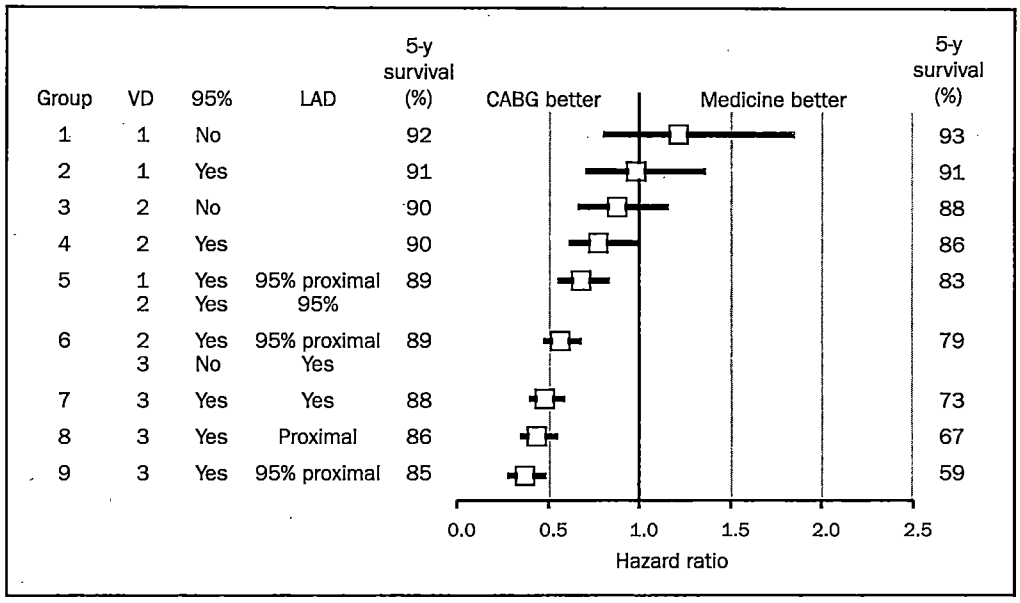

FIGURE 3. Five-year survival rate in patients according to severity and proximity of coronary artery lesions and adjusted hazard ratios for coronary artery bypass grafting (CABG) vs medical treatment. 95% = 95% coronary artery stenosis; LAD = left anterior descending artery; VD = number of diseased vessels.
From *J Thorac Cardiovasc Surg*,[32] with permission from Elsevier.

- Resting heart rate > 90 bpm at first recheck after revascularization surgery is also a poor risk factor. There was a 2.26 hazard ratio associated with additional cardiac events, but a weak relationship with all cause mortality. (Frank)
- Patient expectation of recover also significantly impacts outcome.

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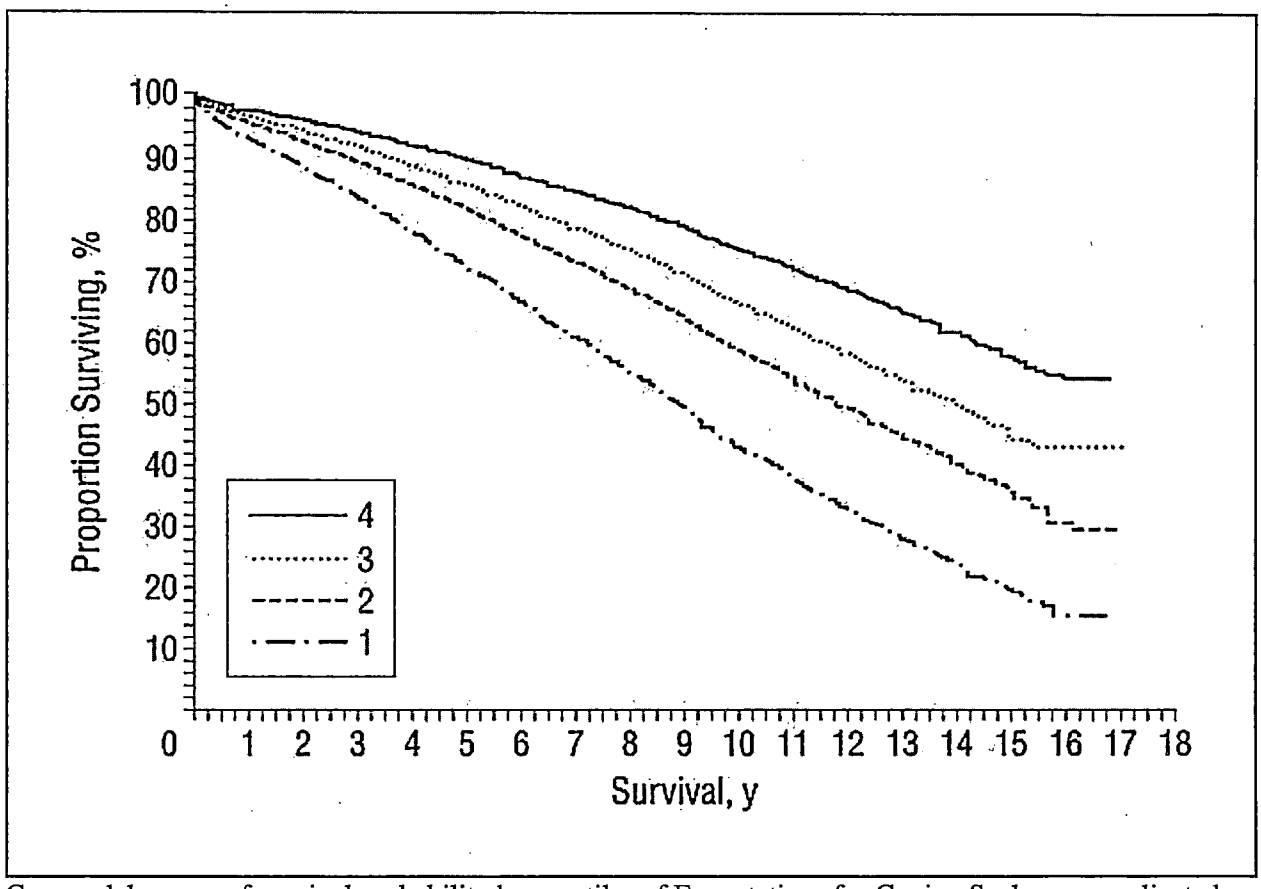

Cox model curves of survival probability by quartiles of Expectations for Coping Scale scores adjusted within quartile for age, sex, treatment, disease severity, comorbidity, and smoking status. "4" Indicates high expectation scores, and "1" indicates low expectation scores. (Barefoot)

- Myocardial infarctions have been divided into 5 types: I – V
    - Mortality in Type II MI's is approximately 50% at 2 years (Saaby)
    - Mortality in Type I MI's is approximately 25% at 2 years (Saaby)

Type 1 (spontaneous MI): MI consequent to a pathologic process in the wall of the coronary artery (eg, plaque erosion/rupture, fissuring, or dissection), resulting in intraluminal thrombus
Type 2 (MI secondary to an ischemic imbalance): MI consequent to increased oxygen demand or decreased supply (eg, coronary endothelial dysfunction, coronary artery spasm, coronary artery embolus, tachy-/brady-arrhythmias, anemia, respiratory failure, hypertension or hypotension)
Type 3 (MI resulting in death when biomarker values are unavailable): Sudden unexpected cardiac death before blood samples for biomarkers could be drawn or before their appearance in the blood

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Type 4a (MI related to PCI): See criteria directly above.
Type 4b (MI related to stent thrombosis): See criteria directly above.
Type 5 (MI related to CABG): See criteria directly above.

- Nonobstructive CAD patients have up to a 4.5x increased risk of MI and a 1.6x risk of 1 year mortality compared to non-CAD patients (Maddox)

Barefoot JC, Brummett BH, Williams RB et al. Recovery expectations and long term prognosis of patients with coronary heart disease. Arch Intern Med 171:929-935, 2011.
Cassar A, Holmes DR, Rihal C. Chronic coronary artery disease: diagnosis and management. Mayo Clin Proc 84:1130-1146, 2009.
Clarke R, Emberson J, Fletcher A et al. Life expectancy in relation to cardiovascular risk factors. BMJ 2009:339:b3513doi:10:1136/bmj.b3513.
Emond, M, Mock MB, David KB et al. Long-term survival of medically treated patients in the Coronary Artery Surgery Study Registry. Circulation 90:2645-2657, 1994.
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Jones RH, Kesler K, Phillips HR et al. Long-term survival benefits of coronary artery bypass grafting and percutaneous transluminal angioplasty in patients with CAD. J Thorac Cardiovasc Surg. 111:1013-1025, 1996.
Maddox TM, Stanislawski MA, Grunwald GK et al. Nonobstructive CAD and risk of MI. JAMA 312:1754-1763, 2014.
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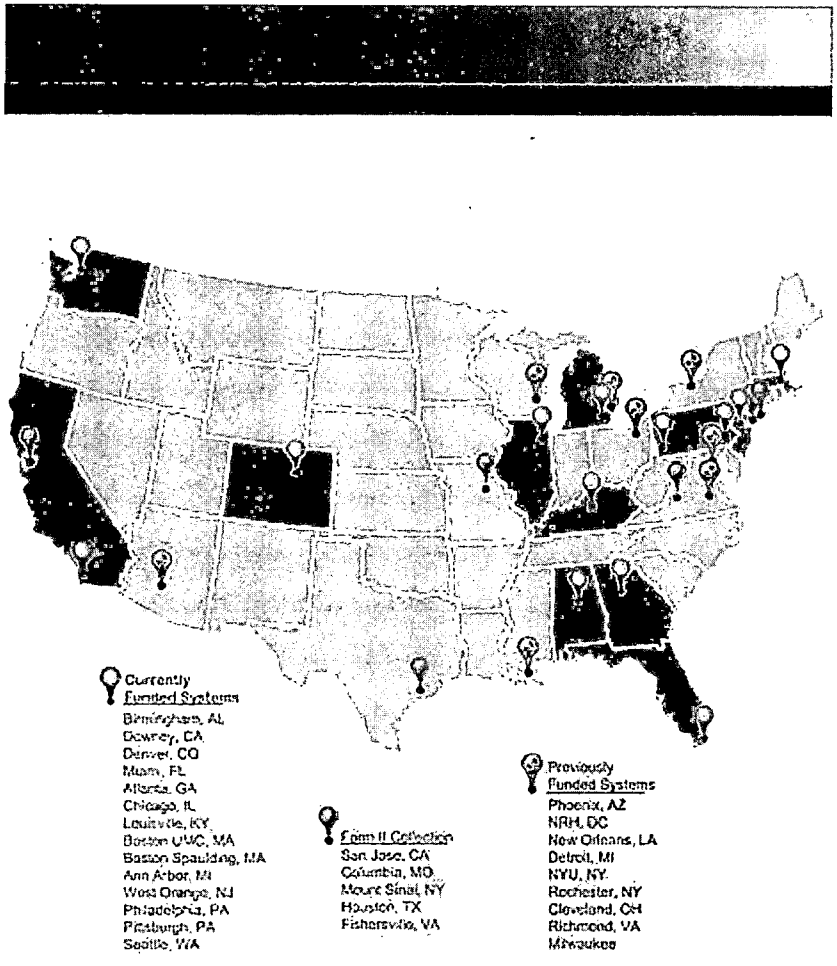
Spinal Cord Injury and Life Expectancy



This report is for dissemination within the SCI Model Systems.

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Table 14B. Life expectancy for SCI persons surviving at least 1 year post-injury.

Current Age	Life Expectancy (Years)					
		Not Ventilator Dependent				Ventilator Dependent
	No SCI	Motor Functional Any Level *AIS-D*	Paraplegia	Tetraplegia C5-C8	Tetraplegia C1-C4	Any Level
10 years	69.1	62.7	55.0	49.9	46.0	33.6
15 years	64.1	57.7	50.1	45.1	41.2	29.0
20 years	59.3	53.0	45.5	40.6	36.9	25.3
25 years	54.6	48.4	41.1	36.4	32.9	22.1
30 years	49.8	43.7	36.7	32.2	28.8	18.9
35 years	45.1	39.1	32.3	28.0	24.8	15.6
40 years	40.4	34.6	28.0	23.9	20.9	12.4
45 years	35.8	30.1	23.9	20.0	17.2	9.6
50 years	31.3	25.9	20.1	16.5	14.0	7.3
55 years	27.1	22.0	16.6	13.4	11.1	5.4
60 years	23.0	18.2	13.3	10.5	8.6	3.9
65 years	19.1	14.7	10.4	8.0	6.3	2.6
70 years	15.5	11.5	7.8	5.8	4.5	1.5
75 years	12.1	8.6	5.5	3.9	2.9	0.7
80 years	9.1	6.1	3.6	2.4	1.7	0.1

(1) Values for persons with no SCI are from the 2009 U.S. Life Tables for the general population.

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Coumadinization and Life Expectancy

- Most common drug causing adverse effects during therapeutic use
- Intracerebral hemorrhage in patients on anticoagulants is epidemic in patients > =55 years of age.
- Substantially more bleeding on patients with oral anticoagulation
- ICH is associated with a high mortality
- Falls are not in themselves a great risk

Donze J, Clair C, Hug B et al. Risk of falls and major bleeds in patients on oral anticoagulation therapy. AM J Med 125:773-778, 2012.
Fang MC, Go AS, Chang Y et al. Death and Disability from Warfarin-Associated Intracranial and Extracranial Hemorrhages. American Journal of Medicine 120:700-705, 2007.
Haq SA, Heitner JF, Sacchi TJ. Long-term effect of chronic oral anticoagulation with warfarin after acute MI. Am J Med 123:250-258, 2010.
Wysowski DK, Nourjah P, Swartz L. Bleeding complications with warfarin use: a prevalent adverse effect resulting in regulatory action. Arch Intern Med 167:1414-1419, 2007.
Siracuse JJ, Robich MP, Gautum S et al. Antiplatelet agents, warfarin, and epidemic intracranial hemorrhage. Surgery 8/19/10.

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Personality Disorder and Life Expectancy

- Life expectancy at birth is 63.3 years for women and 59.1 years for men
- Reduction of 18.7 and 17.7 years for women/men
- SMR 5.0 and 3.5 for women/men (Fok)
- SMR of 2.9 and 4.3 for women/men (Hoye)
- When compared to the mortality in the general population, men and women with personality disorder diagnoses had 4.3 (95% CI: 3.2-5.9) and 2.9 (95% CI: 1.9-4.5) times
- Hiroeh showed SMR of 4.65 and 4.06 for women and men
- Natural cause mortality was associated with mild problems of alcohol or drug use
- Unnatural cause mortality was associated only with severe alcohol or drug use

Fok MLY, Hayes RD, Chang CK et al. Life expectancy at birth and all cause mortality among people with personality disorder. J Psychosomatic Research 73:104-107, 2012.
Fok MLY, Stewart R, Hayes et al. Predictors of Natural and Unnatural Mortality among Patients with Personality Disorder: Evidence from a Large UK Case Register. PLOS One DOI: 10.1371/journal.pone.0100979
Hiroeh U, Appleby L, Mortensen PB et al. Death by homicide, suicide, and other unnatural causes in people with mental illness: a population-based study. Lancet 358:2110-2012, 2001.
Høye A1, Jacobsen BK, Hansen V. Sex differences in mortality of admitted patients with personality disorders in North Norway--a prospective register study. BMC Psychiatry. 2013 Nov 26;13:317. doi: 10.1186/1471-244X-13-317.

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Alcohol and Life Expectancy

- Alcohol use is the 3rd leading cause of preventable death in the United States.
- Eight-five thousand deaths are attributable to alcohol; ½ are alcohol-related injury.
- Living alone is associated with a substantially increased risk of alcohol-related mortality, irrespective of gender, socioeconomic status, or the specific cause of death.
- Overall mortality risk for men ~ 5.6
    - Especially in people living alone (Herttua)
- Vodka is a major cause of high risk of premature death in Russian adults (Zaridze)
- Patients who consume 4+ drinks (one beer, one glass of wine, one mixed drink) have significant elevation of relative risk:
    - Cirrhosis:
        - 7.5 men
        - 4.8 women
    - Injuries
        - 1.3 men
    - ENT, esophageal and liver cancer
        - 2.8 men
        - 3.0 women

Herttua K, Martikainen P, Vahtera J et al. Living Alone and Alcohol-Related Mortality: A Population-Based Cohort Study from Finland. PLOS Medicine September 2011, Volume 8, Issue 9, e1001094
Liskow BI, Powell BJ, Penick E et al. Mortality in male alcoholics after 10-14 years. J Stud Alcohol 61:853-861, 2000.
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Thompson W, Lande RG. Alcoholism. eMedicine
http://emedicine.medscape.com/article/285913
Zaridze D, Lewington S, Boroda A et al. Alcohol and mortality in Russia: prospective observational study of 151,000 adults. Lancet 383:1465-1473, 2014.

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Smoking and Life Expectancy

- The most pronounced differences in life expectancy are between nonsmokers and heavy smokers (variably defined, but over 20 cigarettes per day in some series).
- The effect has been reported to be as profound as a 25% diminution in life expectancy.
- The CDC estimated that adult male/female smokers lost an average of 13.2/14.5 years of life, because of smoking. Corroborated by Jha.
- The most recent Surgeon General's Report shows the relative risk for smokers is 2.3 in men and 1.9 in women.
- Even when accounting for social class, smokers (averaging 15-20 cigarettes per day) had a mortality rate of 1.7 – 4.2 times higher compared with higher social status non-smokers. (Gruer, Thun)
- Japanese and British smokers lose 8/10 years on average (men/women).

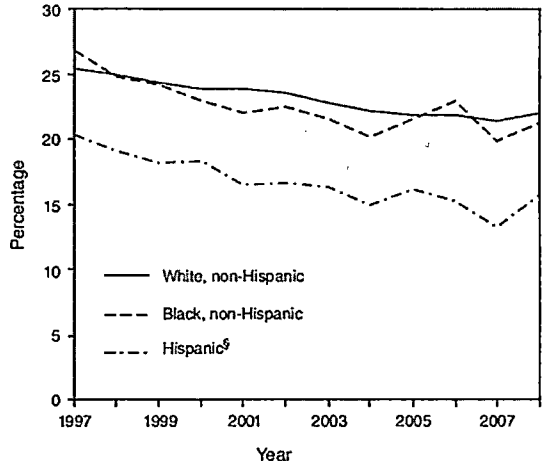

Figure 1: US Adults That Continue to Smoke: National Health Interview Survey, US, 1997-2008.

- Zheng found risk ratios of 1.44/1.48 for men/women compared with never smokers
- Smokers have increased risk of renal failure, intestinal ischemia, hypertensive heart disease, various respiratory diseases, breast cancer, and prostate cancer (Carter)
- In a meta-analysis Shavelle et al offered the following table:

Relative Risk for Smoking, Stratified by Pack Years

Database	Low (0-10 PY)	Medium (10-30 PY)	High (>30 PY)
CHS	1.18	1.46	1.96
NHANES	1.24	1.57	1.80

Basavaraj S. Smoking and loss of longevity in Canada. Canadian Journal of Public Health 84:341-345, 1993.
Blanco-Cedres L, Daviglus ML, Garside DB et al. Relation of cigarette smoking to 25-year mortality in middle-aged men with low baseline serum cholesterol: the Chicago Heart Association Detection Project in Industry. American Journal of Epidemiology 155:354-60, 2002.

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www.cdc.gov/tobacco/data_statistics/sgr/sgr_2004/index.htm.
Centers for Disease Control. Annual smoking-attributable mortality, years of potential life lost and economic costs: US, 1995-1999. Morbidity and Mortality Weekly Report 51:300-303, 2002.
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Sakata R, McGale P, Grant EJ et al. Impact of smoking on mortality and life expectancy in Japanese smokers. BMJ 2012:345:e7093
Shavelle R, Paculdo Dr, Strauss DJ et al. Smoking habit and mortality. J Insurance Med 40:170-178, 2008.
Shibuya K. Changes in mortality and years of life lost attirubatle to tobacco in Japan, 1985 and 1995. Asia and Pacific Journal of Public Health 11:65-70, 1999.
Stapleton MP, Palmer CT. Cigarette smoking in Kentucky: smoking-attributable mortality and years of potential life lost. Journal of the Kentucky Medical Association 9:451-455, 1998.
Strandberg AY, Strandberg TE, Pitkala K et al. Effects of smoking in midline on health-related quality of life in old age. Arch Intern Med 168:1968-1974, 2008.
Thun MJ, Carter BD, Feskanich D et al. Fifty year trends in smoking related mortality in the US. NEJM 368:351-364, 2013.
Zheng W, McLerran DF, Rolland BA et al. Burden of total and cause-specific mortality related to tobacco smoking among adults aged ≥ 45 years in Asia: pooled analysis of 21 cohorts. PLOS Medicine April 2004 e100163.

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Carter BD, Abnet CC, Diane-Feskanich D et al. Smoking and mortality: beyond established causes. NEJM 372:631-640, 2015.

BASED ON THESE STUDIES IT IS MY ESTIMATION THAT THE PATIENT HAS A LIFE EXPECTANCY OF TWENTY YEARS UNTIL THE AGE OF 65.

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COST OF SPINAL CORD INJURY CARE

Costs of care for spinal cord injury have been recently updated by the Model Spinal Cord Injury System and others in a volume published in Topics in Spinal Cord Injury Rehabilitation 16:1-88, 2011. Pertinent excerpts of this information is provided below.

Costs in the First and Second Year within the Model SCI System

DeVivo MJ, Chen Y, Mennemeyer ST et al. Costs of care following SCI. Topics in Spinal Cord Injury Rehabilitation 16:1-9, 2011.

DeVivo et al have investigated the dollars involved in the first and 2nd year after SCI.

Table 1. Mean hospitalization lengths of stay, charges, and costs by neurologic category (2009 US dollars)

Cost category	C1-4 ABC	C5-8 ABC	T1-S5 ABC	AIS D	All groups
Acute care/rehabilitation sample size	203	334	606	533	1,676
Initial acute care days	32.3	25.4	18.2	12.6	19.4
Initial acute care charges	505,029	361,030	256,992	170,915	278,161
Initial acute care costs	143,359	100,079	71,083	45,155	76,711
Rehabilitation days	76.1	63.1	43.6	32.0	47.7
Rehabilitation charges	286,250	215,301	133,300	98,405	157,151
Rehabilitation costs	132,758	93,201	58,410	40,034	68,543
Rehospitalization sample size	1,100	1,929	3,219	1,786	8,034
Rehospitalizations days each year	7.7	6.3	6.4	2.2	5.6
Rehospitalization charges per year	30,975	25,333	25,533	8,764	22,531
Rehospitalization costs each year	15,929	13,027	13,130	4,507	11,587

Note: AIS = American Spinal Injury Association Impairment Scale.

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Table 2. Mean charges during the first year after injury by neurologic category (2009 US dollars)

Cost category	C1-4 ABC	C5-8 ABC	T1-S5 ABC	AIS D	All Groups
Sample size	26	50	73	78	227
Emergency medical services	1,879	1,489	1,517	1,239	1,457
Nursing home[a]	3,968	2,109	1,103	1,180	1,750
Outpatient services	5,294	4,414	3,913	4,015	4,217
Physician fees	959	706	838	783	804
Equipment	21,667	15,717	5,368	2,745	8,613
Environmental modifications	12,214	11,572	9,442	465	7,144
Medications	2,101	1,872	1,356	726	1,338
Supplies	1,809	1,865	2,003	505	1,436
Attendant care[b]	79,527	46,729	21,168	20,631	37,192
Vocational rehabilitation	1,341	232	891	240	573
Miscellaneous	347	517	1,209	528	722

Note: AIS = American Spinal Injury Association Impairment Scale.

[a]Sample sizes for nursing home costs: C1-4 = 1,117; C5-8 = 1,976; T1-S5 = 3,325; AIS D = 1,821.

[b]Sample sizes for attendant care costs: C1-4 = 1,031; C5-8 = 1,837; T1-S5 = 3,053; AIS D = 1,716.

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Table 3. Mean annual charges beginning in the second year after injury by neurologic category (2009 US dollars)

Cost category	C1-4 ABC	C5-8 ABC	T1-S5 ABC	AIS D	All groups
Sample size	55	131	200	122	508
Nursing home[a]	3,968	2,109	1,103	1,180	1,750
Outpatient services	3,099	1,786	1,390	979	1,578
Physician fees	563	613	508	306	492
Equipment	5,231	2,538	1,731	743	2,081
Environmental modifications	942	1,602	1,705	89	1,208
Medications	2,243	2,130	1,356	888	1,540
Supplies	2,379	2,306	2,002	836	1,841
Attendant care[b]	114,515	61,780	25,524	23,608	45,837
Vocational rehabilitation	624	644	281	150	381
Miscellaneous	1,015	719	417	249	520

Note: AIS = American Spinal Injury Association Impairment Scale.

[a]Sample sizes for nursing home costs: C1-4 = 1,117; C5-8 = 1,976; T1-S5 = 3,325; AIS D = 1,821.

[b]Sample sizes for attendant care costs: C1-4 = 1,031; C5-8 = 1,837; T1-S5 = 3,053; AIS D = 1,716.

Table 4. Mean total charges and costs by neurologic category (2009 US dollars)

Cost category	C1-4 ABC	C5-8 ABC	T1-S5 ABC	AIS D	All groups
First-year charges	953,360	688,886	464,633	311,141	523,089
First-year costs	423,152	293,529	191,431	122,753	222,087
Annual charges after year 1	165,554	101,560	61,550	37,792	79,759
Annual costs after year 1	150,508	89,254	49,147	33,535	68,815

Note: AIS = American Spinal Injury Association Impairment Scale.

Comments

- Costs differ from charges in that they reflect ratios of cost to charge.
- The mean cost of attendant care per year was $45,837.
- The mean cost of hospitalizations per year was $22,531.

Lifetime Costs within the Model SCI System

Cao Y, Chen Y, DeVivo MJ. Lifetime direct costs after SCI. Topics in Spinal Cord Injury Rehabilitation 16:10-16, 2011.

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Cao et al determined the lifetime costs for patients with SCI. They are exhibited below for a 25 and 50 year old sample patient.

Table 1. Annual direct charges and costs by neurologic category (2009 US dollars)

	Neurologic category			
	C1-4 ABC	C5-8 ABC	T1-S5 ABC	AIS D
Annual direct charges				
First year (t =1)	953,360	688,886	464,633	311,141
After first year (t >1)	165,554	101,560	61,550	37,792
Annual direct costs[a]				
First year (t =1)	423,152	293,529	191,431	122,753
After first year (t >1)	150,508	89,254	49,147	33,535

[a]Adjusted by the cost to charge ratios or insurance reimbursement rates.

Table 2. Calculation of standardized mortality ratio (SMR) by neurologic category

	Neurologic category			
	C1-4 ABC	C5-8 ABC	T1-S5 ABC	AIS D
Observed death	2,591	2,589	2,773	1,845
Expected death	271	517	858	1,071
SMR	9.55	5.01	3.23	1.72

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Table 4. Present value of average lifetime direct charges (2009 US dollars) for persons with SCI by age at injury, neurologic category, and assumed discount rates

Age at injury, years	Discount rate	Neurologic category			
		C1-4 ABC	C5-8 ABC	T1-S5 ABC	AIS D
25	0	5,431,821	4,166,101	2,878,134	2,061,926
	2	4,230,089	3,090,767	2,068,495	1,413,206
	4	3,465,950	2,455,450	1,612,937	1,072,243
	6	2,955,847	2,055,754	1,337,133	876,286
50	0	2,553,696	2,167,082	1,588,812	1,217,591
	2	2,324,785	1,901,098	1,357,491	997,480
	4	2,144,394	1,703,872	1,193,095	850,499
	6	1,999,896	1,554,162	1,072,821	748,514

Table 5. Present value of average lifetime direct costs (2009 US dollars) adjusted by the cost to charge ratios or insurance reimbursement rates

Age at injury, years	Discount rate	Neurologic category			
		C1-4 ABC	C5-8 ABC	T1-S5 ABC	AIS D
25	0	4,498,914	4,166,101	2,119,176	1,676,594
	2	3,406,399	2,405,967	1,472,688	1,100,947
	4	2,711,708	1,847,631	1,108,930	798,391
	6	2,247,964	1,496,366	888,704	624,508
50	0	1,896,705	1,599,495	1,091,631	928,259
	2	1,688,598	1,365,741	906,924	732,942
	4	1,524,601	1,192,412	775,655	602,518
	6	1,393,235	1,060,843	679,617	512,021

Costs and Causes of Rehospitalization

DeVivo MJ, Farris V. Causes and costs of unplanned hospitalizations among persons with SCI Topics in Spinal Cord Injury Rehabilitation 16:53-61, 2011.

- Urinary tract complications were the most common, skin complications were the 2nd most common cause of hospitalization. Other reasons included respiratory, CNS, GI, injury, psychosocial, musculoskeletal, cardiac, endocrine.
- Mean charges per hospitalization in 2009 dollars were $75,872 for skin problems, and $13,530 for endocrine problems.

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Table 5. Mean charges and costs per hospitalization adjusted to 2009 dollars by primary cause of hospitalization

		Charges ($)		Costs ($)	
Primary cause	n	Mean	*SE*	Mean	*SE*
Urinary tract	124	24,007	2,171	12,617	1,123
Skin	68	75,872	8,835	38,866	4,524
Respiratory system	49	29,975	3,515	15,096	1,811
Nervous system	34	45,386	6,196	23,213	3,170
Digestive system	34	45,062	16,971	23,157	8,689
Injury	26	27,788	3,897	14,308	2,008
Psychosocial problem	20	16,560	2,315	8,505	1,183
Musculoskeletal system	19	69,465	14,056	35,579	7,200
Cardiac system	15	46,006	13,912	23,562	7,125
Endocrine system	9	13,530	3,092	7,063	1,549
Other	16	46,344	11,854	23,871	6,072
Unknown	1	2,707	0	1,386	0
Total[a]	415	40,023	2,580	20,583	1,321

[a]Fifteen cases had unknown charges and costs.

The High Costs of Pressure Sores was Confirmed in a VA Study

Stroupe KT, Manheim L, Evans CT. Cost of treating pressure ulcers for veterans with SCI. Topics in Spinal Cord Injury Rehabilitation 16:62-73, 2011.

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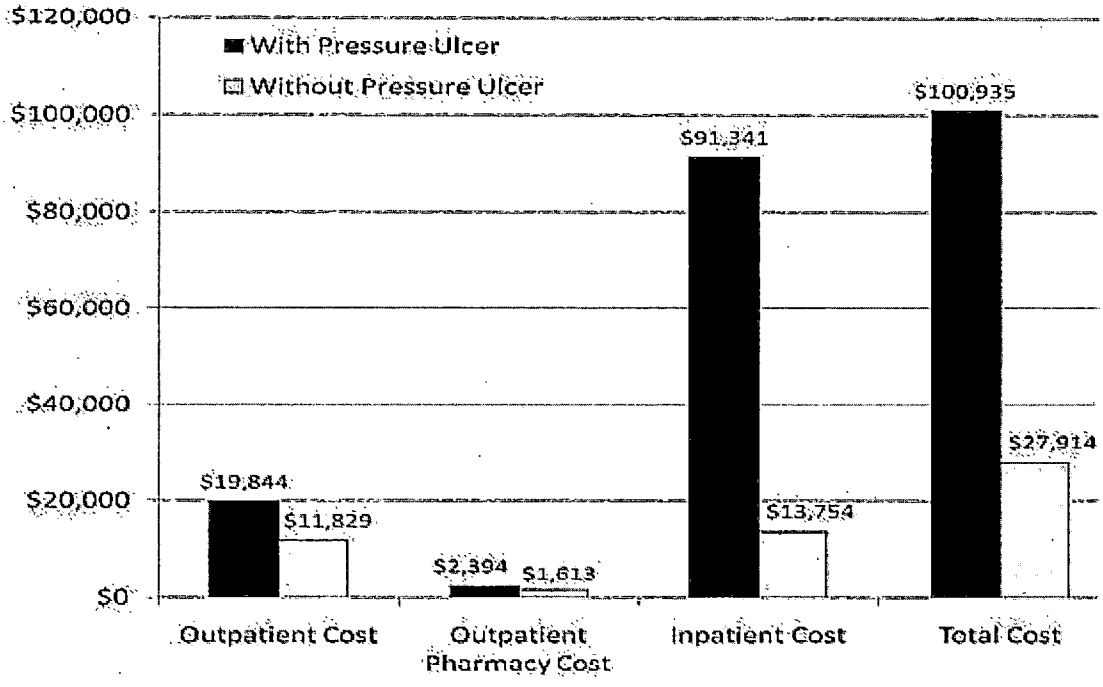

Figure 1. Cost of care per year for veterans with and without pressure ulcers.

- The total costs for the average SCI patient with pressure sores was $100,935.
- The total costs for the average SCI patient without pressure sores was $27,914.

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Critique of the Life Care Plan Prepared by William Burke, PhD

- As there are many items in which I am in agreement I will offer a counterpoint to the Burke Life Care Plan on a page by page basis rather than creating a plan de novo.
- The principal criticism of the Burke Life Care Plan is the inadequate formulation of the patient's life expectancy as I have done above.
- The costs in the life care plan are not in concert with documented costs as reported for spinal cord injury summarized above.
- The life care plan fails to account for the patient's pre-surgical disability. The patient was a disabled with a history of severe chronic low back patient, intrathecal opioid pump, chronic smoker, substance (alcohol) abuser, bilateral hip replacements, walking with a walker. This was a patient unable to carry out many of his own activities of daily living *prior* to surgery.
- Activities of daily living can be defined as follows:
    - Basic Activities of Daily Living
        - Bathing and showering
        - Dressing
        - Eating/feeding
        - Functional mobility
        - Personal hygiene and grooming
        - Toilet hygiene
    - Instrumental ADLs
        - Housework
        - Taking medications as prescribed
        - Managing money
        - Shopping for groceries or clothing
        - Use of telephone or other form of communication
        - Using technology
        - Transportation within the community
        - Care of others
        - Care of pets
        - Child rearing
        - Communication management
        - Community mobility
        - Financial management
        - Health management and maintenance
        - Home establishment and maintenance
        - Meal preparation and cleanup

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    - Religious observances
    - Safety procedures and emergency responses
    - Shopping
- The life care plan by Burke lists expenses on pages 14-16
- Medical care: routine
    - I concur with these items
- Medical care: aggressive
    - The cost of baclofen is overpriced. It is roughly ½ what is stated.
- Medications
    - The patient was already on narcotics prior to surgery. They are not part of the incremental price of cost of care from pre-surgery to post-surgery.
- Therapeutic intervention
    - The patient has already been through rehabilitation. It is not clear that he would benefit from another course of therapies.
    - The patient has a long history of mental health problems. Why is psychotherapy included at this point?
- Homemaker
    - Four hours per day are scheduled. This is not the typical need for a paraplegic. Generally such persons are independent from a wheelchair level and require TWO to THREE hours of care per day. This is documented in the literature below. As noted above, Mr. Huff required assistance in the home pre-surgery as well.

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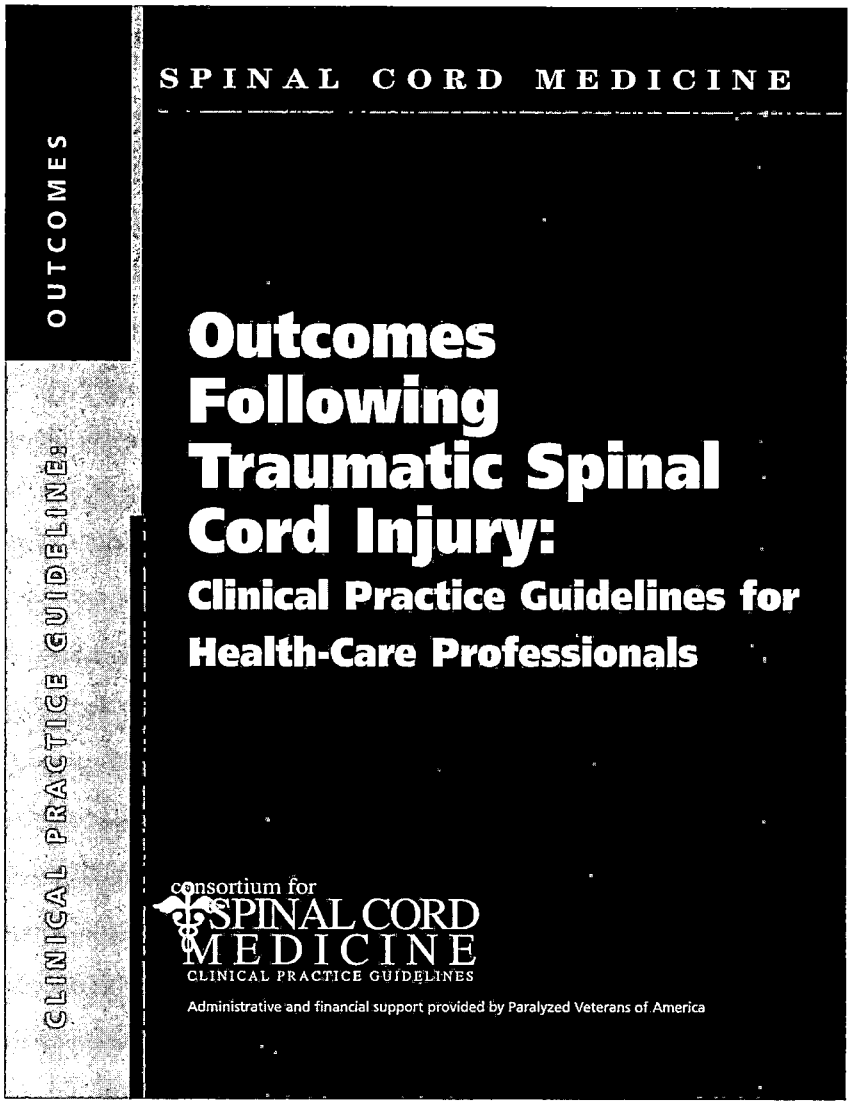

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TABLE 6. Expected Functional Outcomes **Level T1–9**

Functionally relevant muscles innervated: Intrinsics of the hand including thumbs; internal and external intercostals; erector spinae; lumbricals; flexor/extensor/abductor pollicis
Movement possible: Upper extremities fully intact; limited upper trunk stability. Endurance increased secondary innervation of intercostals
Patterns of weakness: Lower trunk paralysis. Total paralysis lower extremities

FIM/Assistance Data: Exp = Expected FIM Score / **Med** = NSCISC Median / **IR** = NSCISC Interquartile Range
NSCISC Sample Size: FIM=144 / Assist=122

	Expected Functional Outcomes	Equipment	FIM/Assistance Data Exp	Med	IR
Respiratory	Compromised vital capacity and endurance				
Bowel	Independent	Elevated padded toilet seat or padded tub bench with commode cutout	6–7	6	4–6
Bladder	Independent		6	6	5–6
Bed Mobility	Independent	Full to king standard bed			
Bed/Wheelchair Transfers	Independent	May or may not require transfer board	6–7	6	6–7
Pressure Relief/ Positioning	Independent	• Wheelchair pressure relief cushion • Postural support devices as indicated • Pressure-relief mattress or overlay may be indicated			
Eating	Independent		7	7	7
Dressing	Independent		7	7	7
Grooming	Independent		7	7	7
Bathing	Independent	• Padded tub transfer bench or shower/commode chair • Handheld shower	6–7	6	5–7
Wheelchair Propulsion	Independent	Manual rigid or folding lightweight wheelchair	6	6	6
Standing/ Ambulation	Standing: Independent Ambulation: Typically not functional	Standing frame			
Communication	Independent				
Transportation	Independent in car, including loading and unloading wheelchair	Hand controls			
Homemaking	Independent with complex meal prep and light housecleaning; total to some assist with heavy housekeeping				
Assist Required	Homemaking: 3 hours/day		2*	3*	0–15*

*Hours per day.

C

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Thank you for asking my input into this preliminary life care planning document.

April 21, 2015

Bradford Mullin, MD, neurosurgeon, evaluated the patient 4/3/15 and issued a report 4/17/15. He opined:

- The patient had disabling problems prior to 2/22/13.
- Sagittal realignment surgery has a high complication rate.
- Arachnoiditis heralded a poor prognosis.
- Upper extremity function is nearly normal.
- He has a significant mental health history.
- He comments on issues in the life care plan.

Dr. Mullin's report does not change my preliminary life care plan.

Richard T. Katz MD

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Washington University School of Medicine
Fellow, American Board of Physical Medicine and Rehabilitation
Fellow, American Board of Independent Medical Examiners
Fellow, American Board of Electrodiagnostic Medicine
Section Editor, AMA Guides, 6th edition