

Post Polio Update 2013

from a neurological perspective

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What's New

Wild Poliovirus - 2013
01 January - 07 May



Data in HQ as of 07 May 2013

Excludes viruses detected from environmental surveillance and vaccine derived polioviruses.

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Infected countries

Polio remains endemic in three countries – Afghanistan, Nigeria and Pakistan and India? – and has re-established transmission in three countries which were previously polio-free (Angola, Chad and Democratic Republic of the Congo). Several more countries had ongoing outbreaks in 2011 due to importations of poliovirus.

Wild Poliovirus (WPV) cases

Total cases	Year-to-date 2013	Year-to-date 2012	Total in 2012
Globally	33	55	223
- in endemic countries	32	52	217
- in non-endemic countries	1	3	6

Case breakdown by country

Countries	Year-to-date 2013				Year-to-date 2012				Total in 2012	Date of most recent case
	WPV	WPV3	W1W3	Total	WPV1	WPV3	W1W3	Total		
Pakistan	8			8	13	2	1	16	58	24-Apr-13
Afghanistan	2			2	6			6	37	28-Mar-13
Nigeria	22			22	23	7		30	122	24-Apr-13
Somalia	1			1						18-Apr-2013
Chad					3			3	5	14-Jun-12
Niger									1	15-Nov-12
Total	33	0	0	33	45	9	1	55	223	
Total in endemic	32	0	0	32	42	9	1	52	217	

New Publications

- 16 of 32 publications relating to polio addressed PPS, rather than acute polio or polio vaccination.
- 8 were reviews or case reports
- 2 were orthopedically focused
- 1 looked at herbal medicine
- Of the remaining 5,
- 1 looked at risk factors
- 2 addressed pain
- 2 were followup from Sweden on their IVIG studies

- There were no presentations at the AAN neurology meeting dealing with PPS (just 3 on West Nile Virus).

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Risk Factors

- Neurol Sci. 2012 Dec;33(6):1271-5. Epub 2012 Jan 14.
 - **Risk factors for post-polio syndrome among an Italian population: a case-control study.**
 - Bertolasi L, Acler M, dall'Ora E, et al.
 - 161 subjects were assessed through a structured questionnaire made of 82 questions and neurological examination.
 - The association with investigated risk factors (sex, age at polio onset, age at onset of symptoms, extension and severity of polio, employment) was analyzed.
 - Symptoms most frequently complained by PPS patients were loss of muscle strength, loss of resistance, loss of muscle volume and generalized fatigue.
1. Female gender
 2. The presence of respiratory disturbance during the acute phase of polio
 3. *The use of orthoses and aids during the recovery and stabilization represented independent risk factors for PPS in the studied population.*

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- Earlier studies—
- J Neurol Sci. 2005 Sep 15;236(1-2):31-5.
- **Prevalence and risk factors of post-polio syndrome in a cohort of polio survivors.**
- Ragonese P, Fierro B, Salemi G, et al.
- In 48 subjects
 1. Higher age at onset of poliomyelitis is inversely associated with PPS.
 2. Association with other diseases may indicate that a chronic physical stress, particularly in already weak motor units, can contribute to the development of signs and symptoms of PPS.
 3. Socio-economic conditions, eg. More highly educated.
- Arch Phys Med Rehabil. 1994 Jul;75(7):770-7.
- **Predictive factors for post-poliomyelitis syndrome.**
- Trojan DA, Cashman NR, Shapiro S, et al.
- In 127 subjects, age at acute polio, degree of recovery after polio, weakness at best point after polio, physical activity, and sex were not contributing factors.
 1. *Degree of initial motor unit involvement as measured by weakness at acute polio*
 2. Possibly the aging process and overuse are important in predicting PPS.

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CURRENT UNDERSTANDING OF CAUSATIVE FACTORS FOR PPS

- *Polio survivors with greater motor unit remodeling and greater residual functional deficits are at greatest risk to develop symptoms of post-polio syndrome (SORENSEN ET AL. 2002). This sets the stage.*
- Overuse of unstable motor units and mechanisms that relate to aging act as triggers for post-polio syndrome.
- Mechanisms of inflammation may contribute to motor unit dysfunction or other symptoms of post-polio.

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Prior Studies of IVIG Treatment

- From the Scandinavian groups who have explored the role of the immune system in PPS (old viral debris activating the immune system to make anti-motor neuron inflammatory chemicals that cause motor nerve dysfunction and central fatigue)—
- Treatment with IVIG reduced the levels of some of the inflammatory chemicals (IFN-gamma, TNF-alpha) present in PPS. Further trials needed to assess relief of symptoms. Gonzalez H et al. 2004; J Neuroimmunol. 150:139-44.
- Case report of a woman with PPS treated with IVIG showed improved strength and reduced fatigue. Farbu E et al. 2004; Tidsskr Nor Laegeforen 124:2357

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Effect of intravenous immunoglobulin in patients with post-polio syndrome -- an uncontrolled pilot study.

[Kaponides G](#), [Gonzalez H](#), [Olsson T](#), [Borg K](#).

- **OBJECTIVE:** To analyse changes in muscle strength, physical performance and quality of life during IVIG treatment in PPS patients.
- **DESIGN:** Open clinical trial. **Patients:** A total of 14 patients (6 women, 8 men; mean age 57 years, range 43-67 years) were included in the study.
- **INTERVENTION:** Treatment with 90 g IVIG (30 g daily for 3 days). Main outcome: Muscle strength, measured with dynamic dynamometry, muscle function, by means of performing the 6-minute walk test, and quality of life, analysed by means of the SF-36 questionnaire, were performed before and after treatment.
- **RESULTS:** For **quality of life** there was a statistically significant improvement for all but one of the 8 multi-item scales of SF-36 when comparing data before and after treatment with IVIG. The multi-item scale **most improved was Vitality**. There was no significant increase in muscle strength and physical performance.
- **CONCLUSION:** Data indicate that IVIG may have a clinically relevant effect, with an improvement in quality of life. The effect may be due to a decrease in an inflammatory process in the central nervous system, which earlier has been reported in patients with past-polio syndrome after IVIG treatment. Since a possible placebo effect cannot be ruled out, a randomized controlled study is **needed**.

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Intravenous immunoglobulin for the post-polio syndrome: a randomized controlled trial.

Gonzalez H, Stibrant-Sunnerhagen K, Sjoberg I, Kaponides G, Olsson T, Borg K
Lancet Neurology 2006 Jun; 5(6):493-500

- **OBJECTIVE:** To analyse changes in muscle strength during IVIG treatment in PPS patients.
- **DESIGN:** Multicenter, double-blind, placebo-controlled trial. Patients: A total of 135 patients with increased cytokine levels in spinal fluid were included in the study.

INTERVENTION: Treatment with 90 g IVIG (30 g daily for 3 days), repeated twice.

Main outcome: Muscle strength.

- **RESULTS:** Patients receiving IVIG had an **increase in muscle strength** of 4.3 %. Patients receiving placebo had a decrease in muscle strength of 5.7 %.
- **CONCLUSION:** Data indicate that IVIG may have a clinically relevant effect, with an improvement in muscle strength. The effect may be due to a decrease in an inflammatory process in the central nervous system, which earlier has been reported in patients with post-polio syndrome after IVIG treatment. The placebo effect is ruled out by this randomized controlled study.

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Post-polio syndrome patients treated with IVIG: a double-blinded randomized controlled pilot study.

Farbu E, Rekand T, Vik-Mo E, Lygren H, Gilhus NE, Aarli JA.

Eur J Neurol. 2007 Jan;14(1):60-5.

- **OBJECTIVE:** To investigate the possible clinical effects of IvIg in PPS.
- **DESIGN:** Double-blinded randomized controlled pilot study
- **INTERVENTION:** Twenty patients were randomized to either IvIg 2 g/kg body weight or placebo. Primary endpoints were changes in pain, fatigue and muscle strength 3 months after treatment. Surrogate endpoints were changes in cerebrospinal fluid (CSF) cytokine levels. Secondary endpoints were pain, fatigue and isometric muscle strength after 6 months.
- **RESULTS:** Patients receiving IvIg reported a **significant improvement in pain** during the first 3 months, but no change was noted for subjective fatigue and muscle strength. CSF levels of tumour necrosis factor-alpha (TNF-alpha) were increased compared with patients with non-inflammatory neurological disorders.
- **CONCLUSION:** The results are promising, but not conclusive because of the low number of patients studied.

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Effect of intravenous immunoglobulin on pain in patients with PPS

Werhagen L, Borg K.

Karolinska Institutet at Danderyd Hospital, Stockholm, Sweden.

J Rehabil Med. 2011 Nov;43(11):1038-40.

- **OBJECTIVE:**

- Pain is a common symptom that affects quality of life in patients with post-polio syndrome. An increase in cytokine in the cerebrospinal fluid suggests that inflammation is pathophysiologically important in post-polio syndrome. Intravenous immunoglobulin might therefore be a therapeutic option. The aim of this study was to analyse the effect of intravenous immunoglobulin treatment on pain in post-polio syndrome.

- **METHODS:**

- An uncontrolled clinical study. Patients with post-polio syndrome and pain (n = 45) underwent a neurological examination and were interviewed about pain before and 6 months after treatment with intravenous immunoglobulin. Pain intensity was measured on a visual analogue scale. The pain was classified according to the International Association for the Study of Pain criteria as neuropathic when it occurred in an area with decreased sensibility, or nociceptive when signs of inflammation and/or painful joints movements were present.

- **RESULTS:**

- After treatment 31/45 (69%) patients were improved, with a mean visual analogue scale decrease from 53 to 42 ($p = 0.001$). Eighteen patients (40%) had a decrease of 20 or more points on the visual analogue scale. The effect of treatment did not differ regarding age, gender and severity of disability.

- **CONCLUSION:**

- **Two-thirds of 45 patients with post-polio syndrome and pain reported a decrease on the visual analogue scale for pain after treatment with intravenous immunoglobulin, and 40% reported a decrease of 20 or more points on the visual analogue scale.**

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IVIG treatment in post-polio patients: evaluation of responders.

Ostlund G, Broman L, Werhagen L, Borg K.

J Neurol. 2012 May 17. [Epub ahead of print]

Final report-- J Neurol. 2012 Dec;259(12):2571-8.

The aim of this work is to evaluate the outcome of IVIG treatment in patients with post-polio syndrome (PPS) and to identify responders.

- The study included 113 PPS patients who had received one IVIG treatment in an open trial, prospective follow-up study. Clinical examination was performed and clinical data were retrieved from medical records. The short form 36 (SF-36), physical activity scale for the elderly (PASE), and the visual analogue scale (VAS) were used as measurements of quality of life, physical activity, and the intensity of pain. Data before treatment and at 6-month follow-up were collected. Analysis was performed in subgroups based on demographic and medical parameters.
- A statistically significant increase of the SF-36 sub domains bodily pain, vitality, social function, role emotional, and the mental compound score (MCS) was found at the 6-month follow-up. A significant decrease of pain was found in patients who reported pain intensity over VAS of 20 mm, in patients younger than 65 years of age and in patients who had paresis in the lower extremities. A trend was found in patients with PPS as the only diagnosis.
- **IVIG leads to increase of quality of life at 6-month follow-up for SF-36 regarding sub domains of bodily pain, vitality, social function, role emotional, as well as for pain. Age below 65 years, paresis in the lower extremities, and lack of concomitant disorders may be the main indicators for a future**

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Treatment Followup Studies

- J Neuroinflammation. 2012 Jul 9;9:167.
- **Intravenous immunoglobulin treatment of the post-polio syndrome: sustained effects on quality of life variables and cytokine expression after one year follow up.**
- Gonzalez H, Khademi M, Borg K, Olsson T.
- IVIG has effects on relevant QoL variables and inflammatory cytokines up to one year in patients with PPS. This gives a basis for scheduling IVIG in upcoming trials with this therapy.

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Limitations to Off-Label IVIG

- **Financial—FDA approved for certain hematologic immunodeficiencies only. Insurance companies may approve for certain immune-mediated neurologic conditions if the literature supports it.**
- **Headache, malaise, nausea, low-grade fever, urticaria, arthralgias, and myalgia. These symptoms typically resolve within a few days after their onset.**
- **Rare serious and potentially fatal side effects include: anaphylactic reactions, aseptic meningitis, acute renal failure, stroke, myocardial infarction, and other thrombotic complications. Many of these side effects have occurred in patients who have significant, underlying risk factors for the development of the event.**
- **Treatment is an infusion, which may be done at home, but usually requires several hours of treatment in an infusion center.**

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Pain

- Rehabil Psychol. 2013 Feb;58(1):1-9.
- **Acceptance of pain in neurological disorders: associations with functioning and psychosocial well-being.**
- Kratz AL, Hirsh AT, Ehde DM, Jensen MP.
- Participants completed self-report measures of pain acceptance, quality of life, pain interference, pain intensity, depression, and social role satisfaction.

RESULTS: Hierarchical linear regressions indicated that

Activity engagement predicted lower pain interference and depression, and greater quality of life.

Pain willingness predicted less pain interference and depression.

So, being more active and accepting pain can reduce the impact of pain on quality of life (activity level, mood). Seems to be a tautology.

- J Rehabil Med. 2013 Feb;45(2):161-3.
- **Impact of pain on quality of life in patients with post-polio syndrome.**
- Werhagen L, Borg K.
- Pain is common in patients with post-polio syndrome.
- Although patients have a high mean VAS score, the pain only affects quality of life for Vitality and General Health, but not for other physical and mental domains.

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• But, pain does have a negative impact on energy and perceived general health.

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Research

- **Glutathione and Health With Post-Polio Syndrome**

- This study is currently recruiting participants.
- University of Michigan
- Collaborator: Penn State University
- ClinicalTrials.gov Identifier: NCT01402570
- Funded by PHI grant 2011
- In this study, people who have symptoms of post polio will take oral glutathione supplements 1000mg per day for three months. Their levels of fatigue, physical function, sleep disturbance, impairment and emotional distress will be measured with both subjective and objective measures.

- **Arm Cycling to Improve Fitness in Polio Survivors**

- This study is currently recruiting participants.
- Royal College of Surgeons, Ireland
- Collaborators: Post Polio Support Group Ireland
- ClinicalTrials.gov Identifier: NCT01271530
- The aim of this study is to investigate the effect of upper limb cardiovascular training on fitness, energy cost of walking, fatigue and pain in polio survivors. Polio survivors often have difficulty accessing aerobic forms of exercise due to limitations in mobility, pain associated with walking and fatigue. This can result in becoming physically unfit and places polio survivors at risk of secondary health problems due to inactivity. A large percentage of polio survivors have lower limb involvement but have strong arms. The participants in this study will exercise at home using simple arm cycles for 8 weeks. They will attend for assessment on two occasions. All exercise will be prescribed by a Physiotherapist and includes measures to ensure safety while exercising at home.

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- **A Randomized, Double Blind, Placebo Controlled Trial L-carnitine and Piracetam in the Treatment of Weakness, Muscle Fatigue and Muscle Pain in the Postpolio Syndrome**
- This study is not yet open for participant recruitment.
- Sponsor: Biolab Sanus Farmaceutica (Brazil)
- ClinicalTrials.gov Identifier: NCT01549847
- This protocol aims to assess of L-carnitine 990mg and piracetam 810mg twice daily for 26 weeks to relieve weakness, muscle fatigue and muscle pain in patients with Postpoliomyelitis Syndrome.

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PHI Announces 2013 Research Award Recipient

Post-Polio Health International (PHI) awarded a \$25,000 grant to study the effects of using an innovative machine that has shown early promising results with frail elders and people with various neurologic conditions in pain reduction, strengthening and bone density improvement.

The study – Effects of Whole Body Vibration on People with Post-Polio Syndrome – will be led by Carolyn Kelley, PT, DSc, NCS, from Texas Woman's University, Houston, Texas. Carlos Vallbona, MD, TIRR-Memorial Hermann Rehabilitation & Research, is part of the research team.

The team will study the possible negative, as well as positive, effects of two innovative machines (Power Plate® pro5™ and Soloflex), machines with a platform that a person can stand or sit on, that vibrates the entire body. "Whole body vibration" is being used in fitness clubs, people's homes, and nursing homes to either enhance exercise protocols or as an exercise substitute.

The study will recruit 40 people who have post-polio syndrome. Participants who qualify will use each of the machines for a month, with the order randomly assigned. People who walk full-time, part-time, and not at all can qualify.

Kelley explains that because this is an interventional study, people will need to either reside in the Houston metropolitan area or be able to stay in Houston for about three months.

For more information about the project and inclusion/exclusion criteria, contact Carolyn Kelley, PT, DSc, NCS at ckelley@twu.edu or 713-794-2087.



Power Plate® pro5™

Background on Power Plate Training

- Scand J Med Sci Sports. 2007 Feb;17(1):12-7.
- Strength training effects of whole-body vibration?
- Nordlund MM, Thorstensson A.
- SourceThe Swedish School of Sport and Health Sciences (GIH), Stockholm, Sweden.
maria.nordlund@gih.se
- Whole-body vibration (WBV) has been suggested to have a beneficial effect on muscle strength. Manufacturers of vibration platforms promote WBV as an effective alternative or complement to resistance training. This study aimed to review systematically the current (August 2005) scientific support for effects of WBV on muscle strength and jump performance. MEDLINE and SPORT DISCUS were searched for the word vibration in combination with strength or training. Twelve articles were included in the final analysis. In four of the five studies that used an adequate design with a control group performing the same exercises as the WBV group, no difference in performance improvement was found between groups, suggesting no or only minor additional effects of WBV as such. Proposed neural mechanisms are discussed.

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Managing Your Polio-related Healthcare

- What do Post Polio Experts do?
And how can your PCMD do it too?
>You and your PCMD must be knowledgeable
Medical Board of CA <http://mbc.ca.gov/> Jan 2002
Excellent easy-to-read reviews on PHI, MayoClinic, NIH websites
- When is it not PPMA?
When it is anything other than new muscle atrophy, weakness, pain, or fatigue. And even then you have to double check that it's not something else.
PPMA may increase symptoms of other conditions.
- Why now?
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Common Questions and Concerns

- Regaining strength in muscles that seem to be getting weaker.
- Pain and fatigue--what to do about them.
- Swallowing problems and other bulbar dysfunction
- Anesthesia when surgery is needed.

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The Bottom Line

- **New or increased symptoms in a polio survivor are PPS only about 1/3 of the time.**
- **New or increased symptoms may be due to another medical or neurological illness or to orthopedic problems, which must be identified and treated.**
- **Treatment of other illnesses in a polio survivor must be monitored relative to the sensitivities of PPS (eg. surgery, chemotherapy, use of cholesterol lowering medication).**

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- **Polio survivors with symptoms of PPS must take care to:**
- **modify lifestyle;**
- **avoid overuse;**
- **use assistive devices and bracing if appropriate;**
- **control weight gain, sleep problems, stress, and pain;**
- **and engage in non-fatiguing exercise for strength and conditioning. Many studies have shown that success in these areas can halt progression of PPS symptoms and promote improvement of 1-2% per year.**

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Case Report #1

Is this polio-related or not?

- A survivor of bulbar polio with moderate residua.
- For more than a month he had mild nausea, bloating, and general malaise--just didn't feel well.
- Primary doctor was on vacation and was having difficulty making an appointment with a substitute. In desperation went to a local emergency unit. Was found to be retaining a large amount of urine—not due to prostate blockage.
- Diagnosed with a neurogenic bladder--weak bladder muscle due to poor nerve supply.
- The nerves that supply the bladder muscle are autonomic nerves (the same ones that supply bowel, stomach, and lower esophagus muscles and are involved in blood pressure control).

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Literature Search

- A neurogenic bladder is the result of interrupted bladder stimulation at the level of the sacral nerves.
- This may result from certain types of surgery on the spinal cord, sacral spinal tumors, or congenital defects.
- It also may be a complication of various diseases, such as syphilis, diabetes mellitus, or poliomyelitis.
- The only two published medical articles he could find were references in the Journal of the American Medical Association in 1948 and the Journal of Urology in 1936.

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- More recent literature suggests long term damage to bladder neurons is extremely rare-- only one definite report of long term damage from 1974.
- Some literature from US and Mexico suggest that there were people diagnosed with polio who had bladder problems who either had multiple sclerosis or Guillain Barre syndrome (one paper suggested it was more likely President Roosevelt actually had GB rather than polio based on his age and pattern of involvement).
- Apparently during the epidemics in the 50's there were about 15% incidences by a few authors of urinary dysfunction in the acute phase of the disease, but it seems the anterior horn cells to the bladder are almost always spared.

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Most recent review from Mexico in 1993:
Bol Med Hosp Infant Mex. 1993 Feb;50(2):136-44.

[The differential diagnosis of poliomyelitis and other acute flaccid paralyzes].
Alcalá H. Departamento de Neurología, Hospital Infantil de México Federico Gómez,

Between June 1988 to January 1991 a total of 246 children with acute flaccid paralysis (AFP) were seen at Hospital Infantil de México, Federico Gómez which was the center of study for AFP for the Poliomyelitis Eradication Program of Mexico.

Of the 246 children, 42 has poliomyelitis (17%); 156 has Guillain-Barré syndrome (GBS) (63.4%); 16 had traumatic neuritis of the sciatic nerve secondary to IM injections (TNC) (6.5%); five had transverse myelitis (2%); the rest (27) had other diseases misdiagnosed as polio (10.9%). The basic clinical characteristics for the diagnosis of poliomyelitis are: myalgias and fever at the onset AFP, paralysis is asymmetrical, of distal predominance and causes severe muscular atrophy and skeletal deformities; the GBS presents as an ascending, symmetrical, areflexic paralysis of distal predominance. It does not causes atrophy or deformities. TNC presents several days after IM injections with pain and hypothermia in the affected limbs; TM is a flaccid, symmetrical paraparesis with neurogenic bladder and a sensory level.

Other entities misdiagnosed as poliomyelitis were: osteoarticular trauma, myopathies and dystrophies, viral myositis, acute cerebellitis, retroperitoneal tumors and upper motor neuron syndromes. Viral studies in stool specimens are essential for the diagnosis of poliomyelitis. CSF and neurophysiological studies (EMG and NCV) are very useful for diagnosis.

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Case Report #2

How safe is anesthesia?

- A survivor of paralytic polio with modest residua and no breathing issues.
- Underwent shoulder surgery as an outpatient. Was given Fentanyl, Versed, and local anesthesia in OR; Dilaudid, Zofran, and Demerol in Recovery.
- Took 4x as long (3 hours) to “wake-up” after surgery.
- Went home and developed erratic breathing and unresponsiveness 2 hours later.
- Was taken to hospital, intubated, and spent 2 days in ICU.
- Both the patient and the surgeon were very knowledgeable about PPS.
- In the PPS literature, it is inadvisable to have surgery with general anesthesia as an out-patient, and the surgeon and anesthesiologist must be familiar with the particular needs of Post-Polio Patients.
- Summary of Anesthesia Issues for the Post-Polio Patient

Selma H. Calmes, MD, (shcmd@ucla.edu) Chairman and Professor, (retired) Department of Anesthesiology, Olive View-UCLA Medical Center, Sylmar, California
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- 1. Prior to surgery, have Pulmonary Function Studies performed. Eg. Residual phrenic nerve problems may not be detected beforehand.
- 2. Do not use out-patient surgery centers for surgery with general anesthesia. ?Colonoscopy
- 3. Be fully aware of anesthesia and pain medication to be used—doses might need to be reduced, certain drugs might need to be avoided, and recovery time might be prolonged.

Registry for Polio Survivors

- <https://www.conemaugh.org/apps/postpolio/>
- The John P. Murtha Neuroscience and Pain Institute, Johnstown, Pennsylvania, launched an online registry of polio survivors to promote research about the late effects of polio and post-polio syndrome.
- 5-10 minutes of on-line questions
- Your identity is kept confidential

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Resources

- WWW.POST-POLIO.ORG
- [WWW.NCBI.NLM.NIH.GOV/
ENTREZ \(PUBMED\)](http://WWW.NCBI.NLM.NIH.GOV/ENTREZ)
- WWW.CLINICALTRIALS.GOV

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