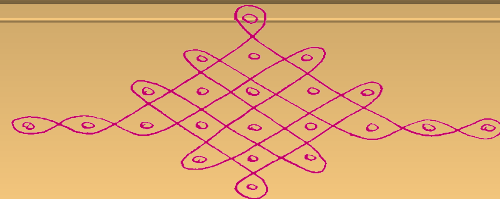
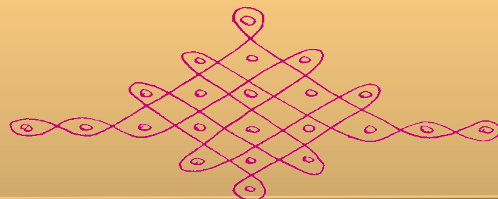
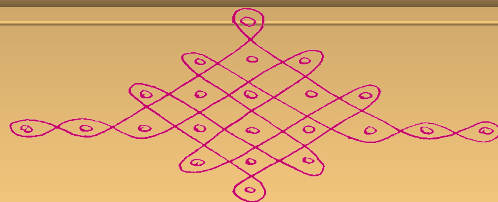


Spinal Injury ^{On} _{While} ^{one} _{In} Manangement





WHITE PAPER ON SPINAL INJURY MANAGEMENT FOR OPINION OF THE EXPERT GROUP



spinal injury

spinal injury

- Described initially as “An ailment not to be treated”
- Management revolutionized during Second World War
 - Sir Ludwig Guttman
 - Sir George Bedbrook
- Numerous spinal injury centres established in developed countries

spinal injury

spinal injury

In Developing countries spinal injury management given low priority because

- Afflicts lower socio economic strata
- Expensive + large infrastructural requirements
- Comparatively lower incidence
- Immediate benefits of treatment not obvious as in other ailments
- Not commercially viable.

white paper

Need

need for white paper

**s u g g e s t
a national protocol
for management**

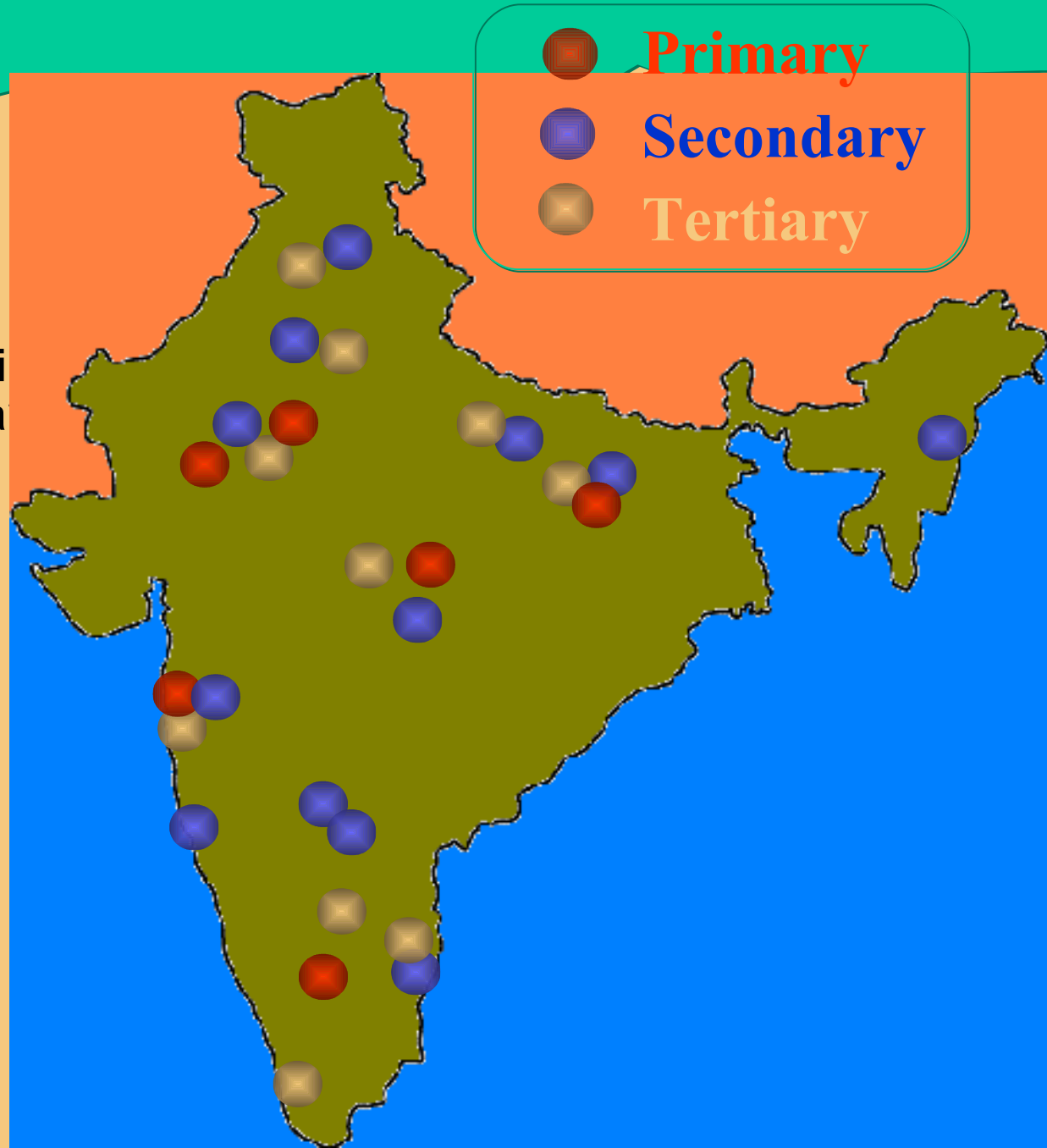
white paper *Compilation*

- ❖ What is the exact challenge in India?
- ❖ How is Spinal Injury being managed today in India?
- ❖ How is Spinal Injury being managed today in developed Countries?
- ❖ How should Spinal Injury be managed in India in the following settings:
 - Primary Level Centre (Rural)
 - Secondary Level Centre
 - Tertiary Level Centre
 - Software Analysis of Questionnaires
 - Software Analysis of Questionnaires
 - National Spinal Injury Database
 - US & UK
 - Practices in developed Countries
 - Proposal with inputs from **Expert Committee**

white paper

Compilation

- ❖ What is the exact challenge in India?
- ❖ How is Spinal Injury being managed today in India
- 34 page questionnaire sent to various people managing spinal injuries
- 53 responses from all over India
- Responses analyzed by special software



white paper *Compilation*

- How should Spinal Injury be managed in India in the following settings:
 - Primary Level Centre (Rural)
 - Secondary Level Centre
 - Tertiary Level Centre
- Draft proposal compiled based on the practices in the developed countries suitably modified to suit Indian condition through the information gathered from the analysis of the questionnaire
- White paper finalised based on inputs of Experts

white paper *Compilation*

Experts of Association of Spine Surgeon of India

- Dr. V.T. Ingalhalikar, Mumbai.
- Dr. Arvind Jayaswal, New Delhi.
- Dr. S. Rajasekaran, Coimbatore.
- Dr. Shekhar Bhojraj, Mumbai.

white paper *Compilation*

Experts of
Spinal Cord Society
(Indian chapter)

Air Marshal A.S. Chahal, New Delhi

Dr. A.K. Mukherjee, New Delhi

Dr. P.K. Dave, New Delhi

Dr. Nalli R. Uvraj, Chennai

Dr. U. Singh, New Delhi

Col. P.K. Sahoo, Delhi

Dr. Raj Bahadur, Chandigarh

Dr. H.N. Bajaj, New Delhi

Dr. Narinder Mathur, Rajasthan

Dr. Kuwar Virender Pratap Singh,
Vanarsasi

Dr. V.P. Sharma, Lucknow

Dr. Dinesh Suman, New Delhi

Capt. Dilip Sinha, Patna

white paper ***Compilation***

Dr. Balu Sankaran, New Delhi

Prof. S.M. Tuli, New Delhi

Dr. H.K. T. Raza, Jabalpur

Prof. P. Kanabar, Ahmedabad

Dr. V.S. Mehta, New Delhi

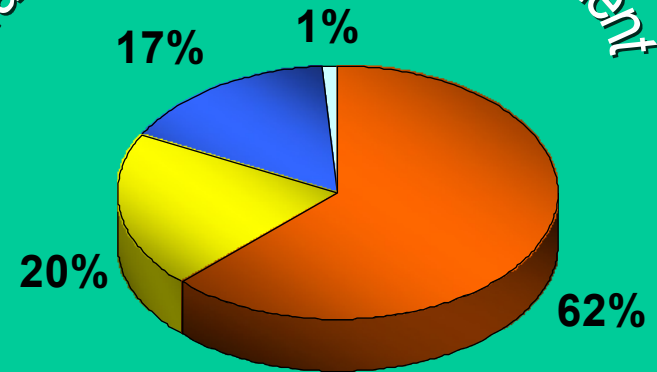
Dr. John Mukhopadhyay, Patna

Dr. A.K. Singh, New Delhi.

extrication techniques

- Trained personnel
- Spine Board
- Cervico head halter, skull tongs or firm plastic collar for neck immobilization
- Moved by four people

evacuation from site of accident



- attendants
- passer by
- traffic police
- trained hospital team

first aid at site of accident

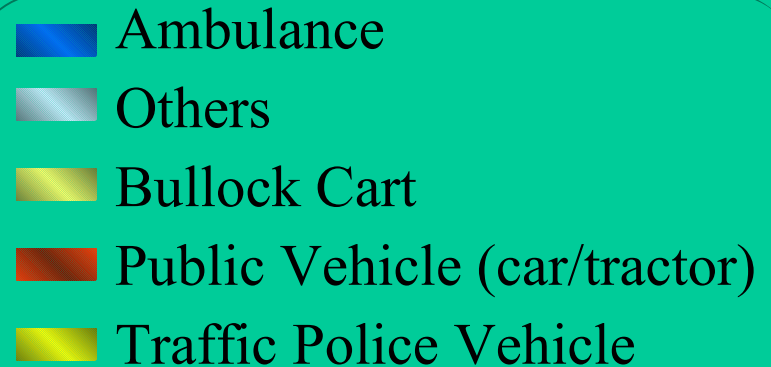
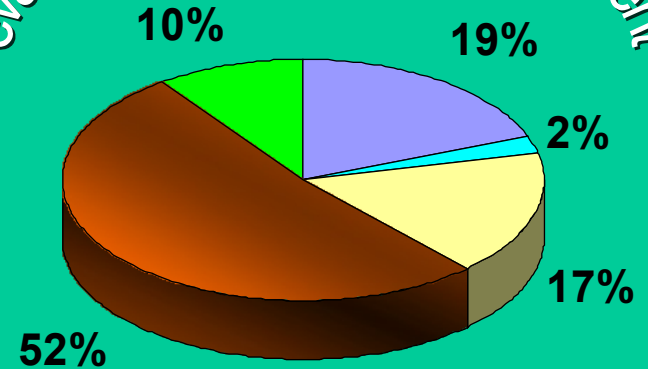
- Head and Neck in neutral position and stabilized by gentle longitudinal traction
- Supine position



evacuation from site of accident

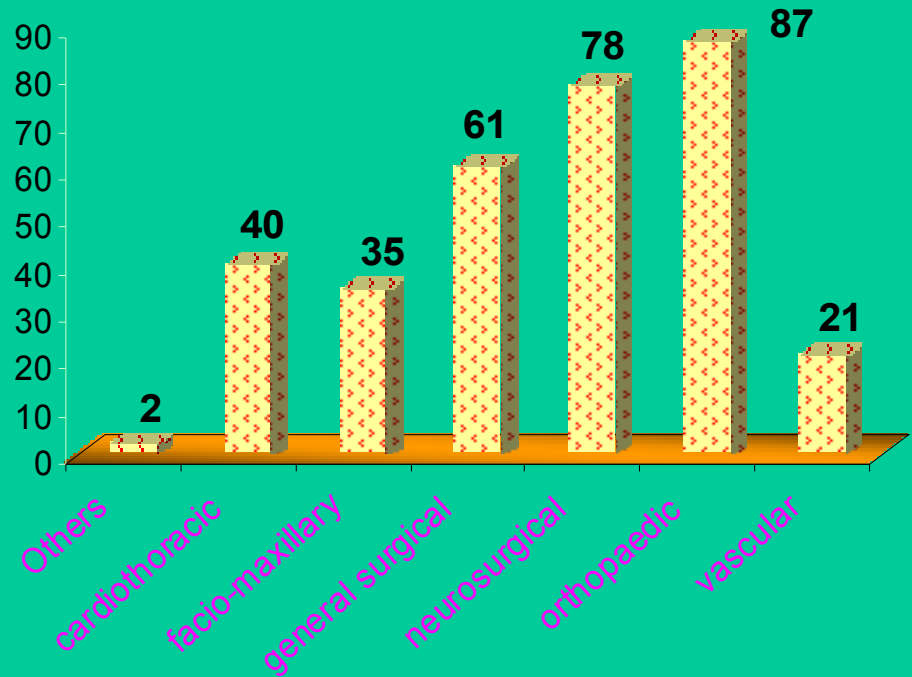
- ❑ Transported slowly by ambulance
- ❑ Taken to nearest major accident and emergency Centre
- ❑ Repeatedly assessed enroute
- ❑ Prevent Hypothermia in tetraplegics
- ❑ Helicopter/air transfer if required

evacuation from site of accident



Screening for Associated /Complications

- ❖ High incidence of associated trauma / complications
- ❖ Classical signs may be absent
- ❖ Facilities for trauma management should be available



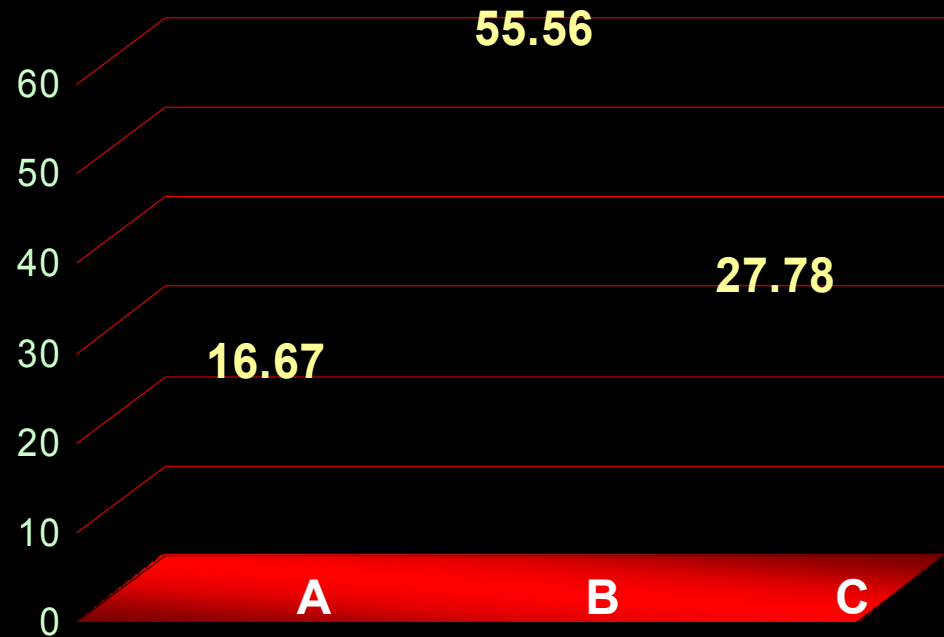
Associated Trauma

Role of Nasogastric Aspiration

- ❖ Aspiration is responsible for a large number of deaths in tetraplegics during the acute phase
- ❖ Nasogastric aspiration should be routinely done in all tetraplegics during acute phase

Percentages

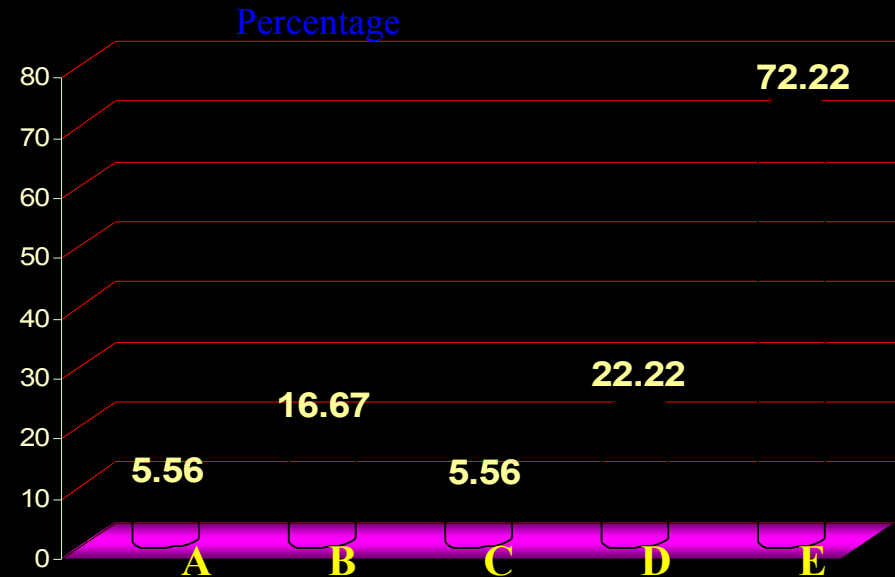
Nasogastric Aspiration



- A. routinely in all spinal injured
- B. if patient develops gastrointestinal complications
- C. routinely in acute phase of tetraplegics

Role of Methylprednisolone

- Uncertain
- Various studies have shown contradicting results
- Three multi Centre NASCIS studies in US inconclusive



- A. all patients
- B. not used
- C. patients reporting ay any time with MRI revealing cord oedema
- D. patients reporting within 24 hrs. of injury
- E. patients reporting within 8 hrs. of injury

use of methylprednisolone

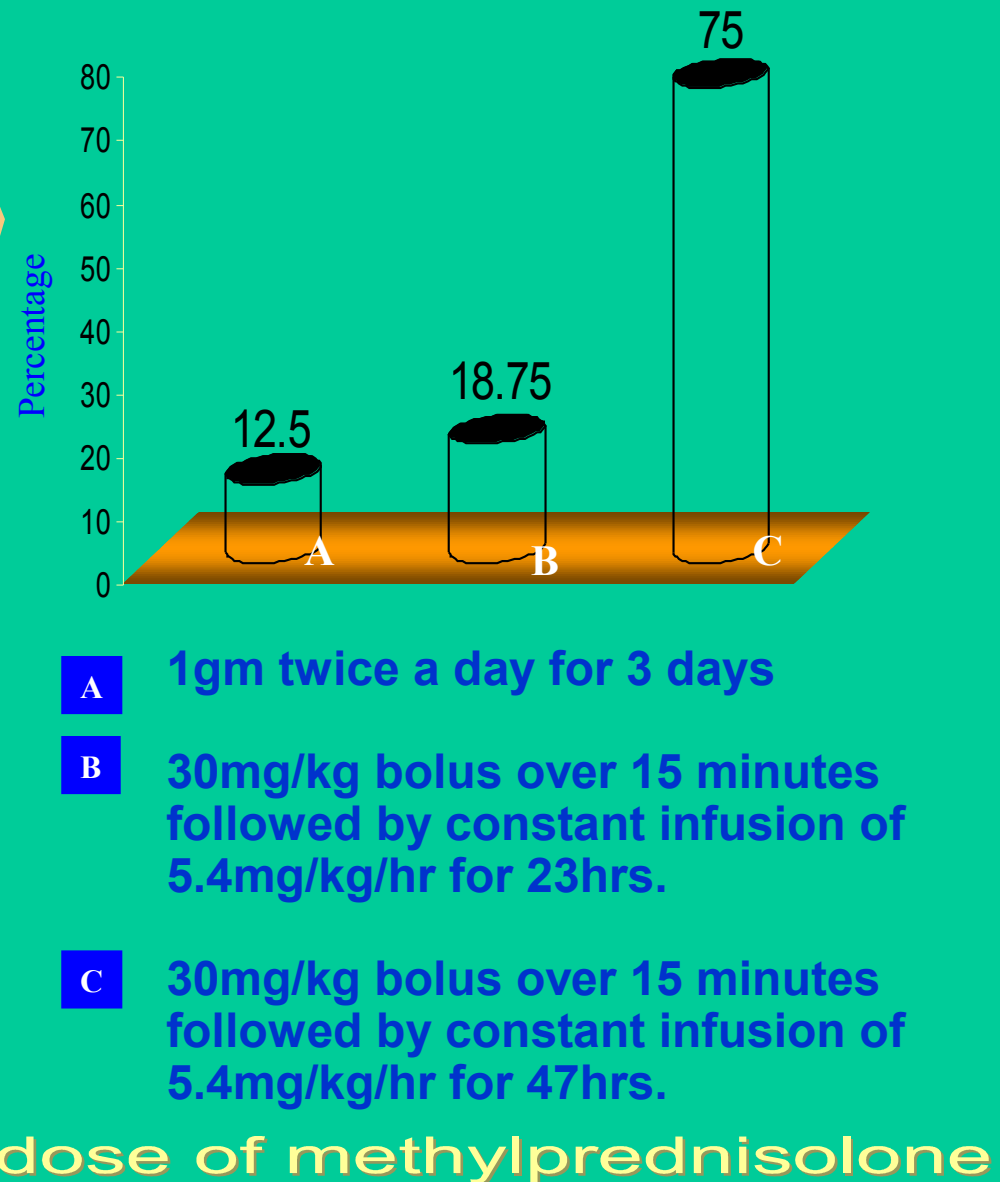
Role of Methylprednisolone

recommendations

- For all patients reporting within 8 hours of injury the option of using methylprednisolone could be given to the patients. However it should be mentioned that there is no definite conclusive evidence of a beneficial effect and that there could be some complications related to its use:

dose

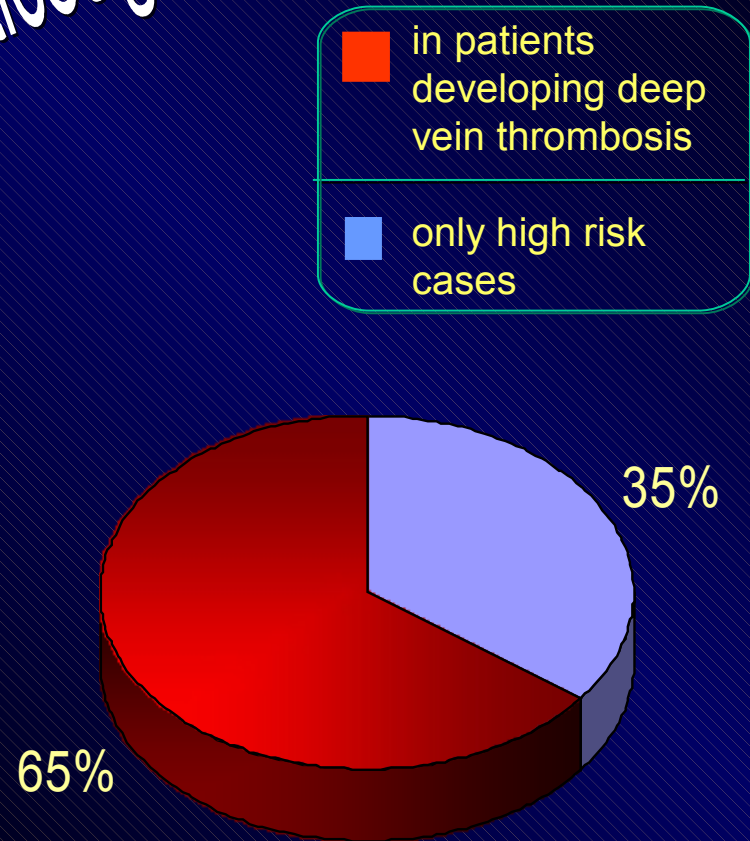
- Bolus – IV 30 mg/kg body weight over 15 minutes
- Constant infusion – 5.4 mg/kg/hour for 23 hours



prophylactic anticoagulant therapy

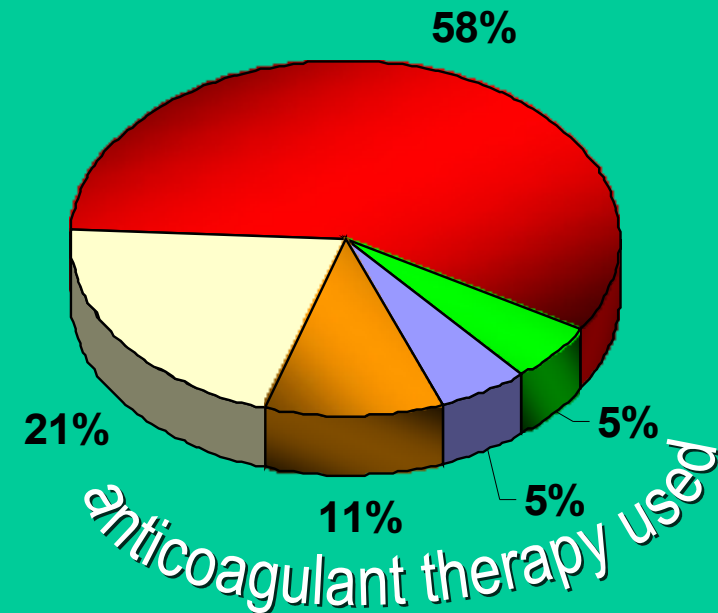
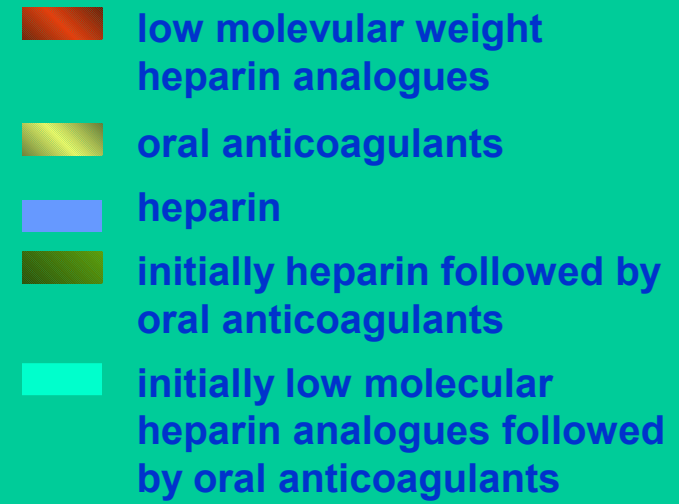
- ❖ Routinely used in developed countries
- ❖ Very low rate of Deep Vein thrombosis reported in India till few years ago. Critics attribute it to inadequate detection

Anticoagulant therapy



prophylactic anticoagulant therapy: recommendations

- ❖ Should be used in high risk cases (Elderly, obese, previous history of DVT or PE, Cigarette smokers, prolonged operating time etc.)
- ❖ Early mobilisation and passive movements
- ❖ External compression



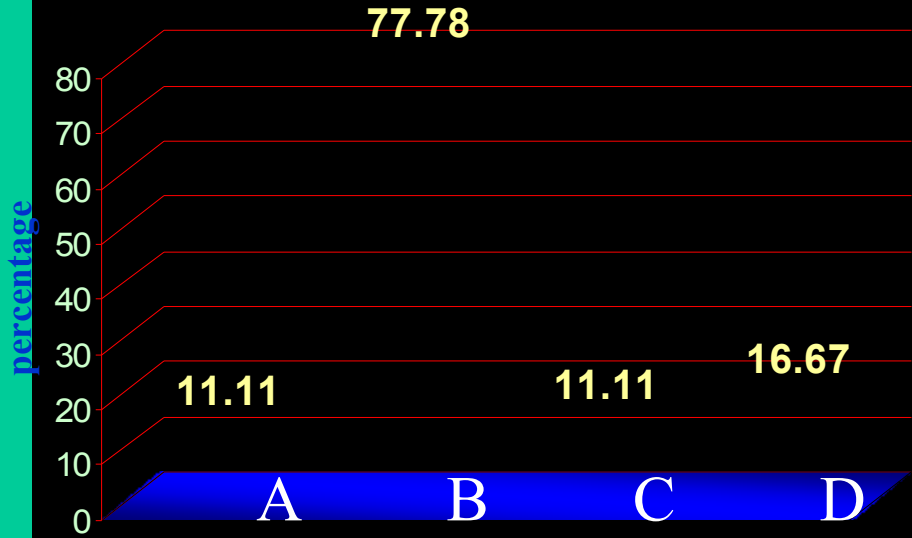
prophylactic anticoagulant therapy: recommendations

- ❖ **Drugs to be used for prophylaxis**
 - **Subcutaneous Heparin 5000 U every 12 hours**
 - **Low molecules weight heparin 3500 anti-Xa unit once daily**
 - **Acenocoumarol (Oral anticoagulant)**
 - **8-12 mg on 1st day**
 - **4-8 mg on 2nd Day**
 - **Maintenance dose 1-8 mg**
 - **Drug dosage monitored by – Activated partial thromboplastin time (APTT) for heparin and low molecular weight heparin**
 - **Prothrombin time/INR for Oral anticoagulants**

respiratory management

- ❖ Chest physiotherapy and monitoring of respiratory parameters
- ❖ Achieve approx 60% of predicted vital capacity

chest physiotherapy



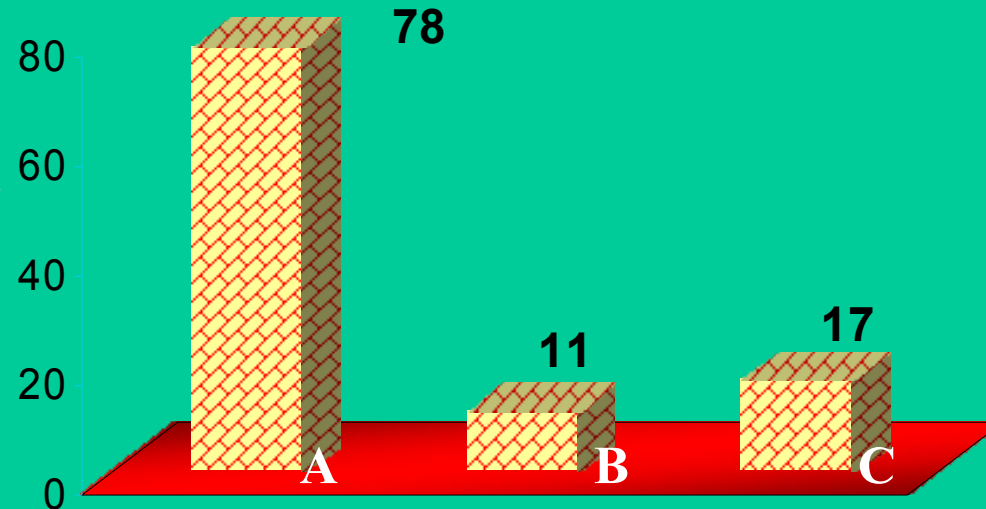
- A.** done for high tetraplegics and patients with chest problems
- B.** done routinely for all patients
- C.** done for ventilatory dependant patients only
- D.** done routinely for all tetraplegics and patients with chest problems

Intubation or tracheostomy & mechanical Ventilation

indications

- ❖ Vital capacity ≤ 1000 ml
- ❖ Abnormal arterial blood gases
- ❖ Frequent atelectasis
- ❖ Consolidation on X-ray chest

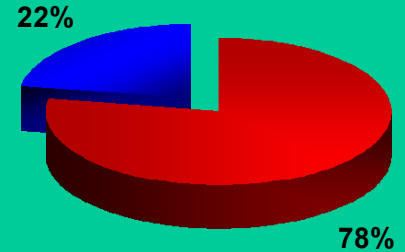
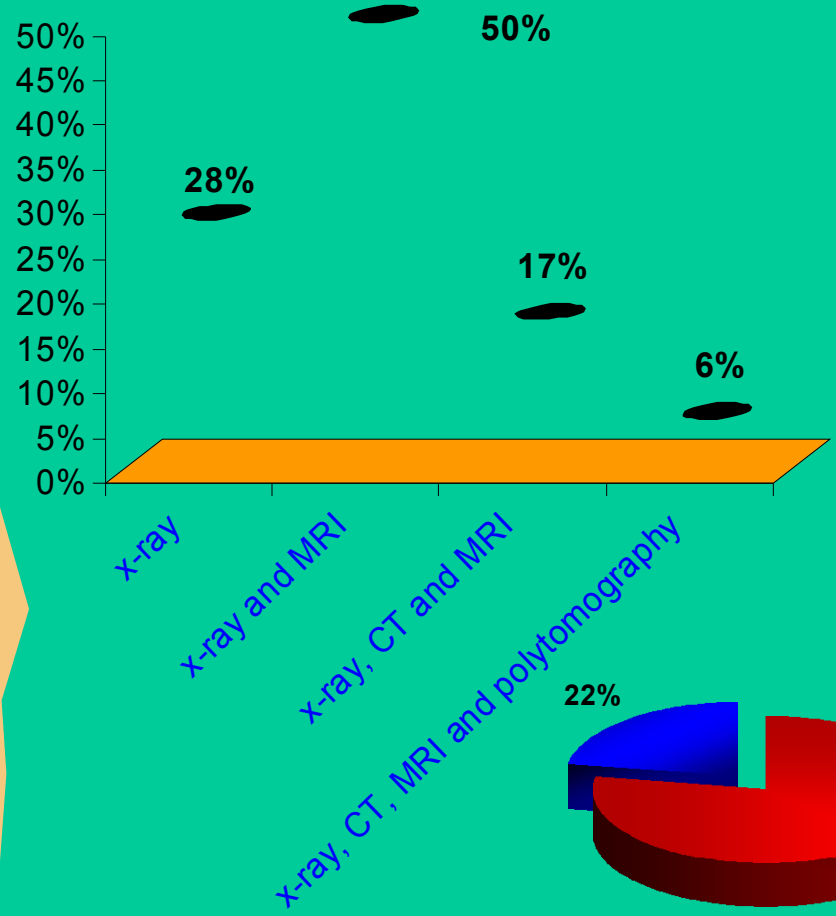
Indication of Intubation at various Hospitals



- A. once patient goes into respiratory depression
- B. prophylactically if SPO2 not maintained
- C. prophylactically if arterial blood gas level falls

radiological evaluation

- ❖ X-ray still the gold standard
- ❖ Should be routinely done for the whole spine
- ❖ CT and MRI desirable

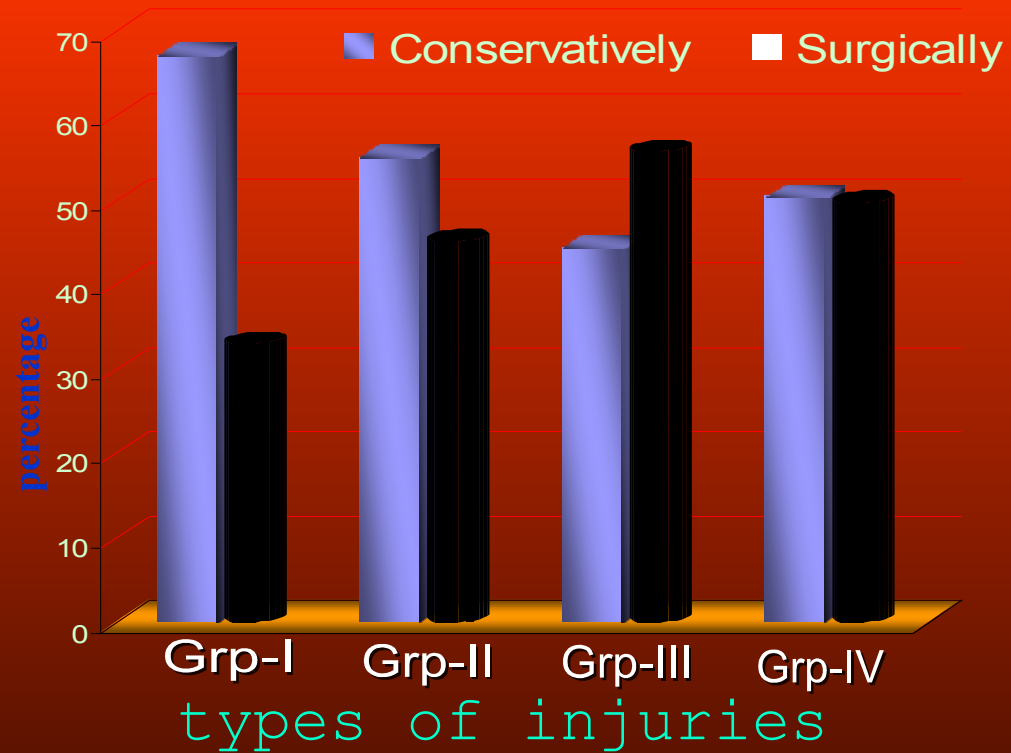


- done routinely for the whole spine
- done only for region of tenderness and or deformity

Radiological evaluation done for

Role of Conservative Management

- ❖ Definite role in stable injuries where spinal alignment is maintained
- ❖ More often in patients with penetrating injuries caused by gunshot, stab etc.

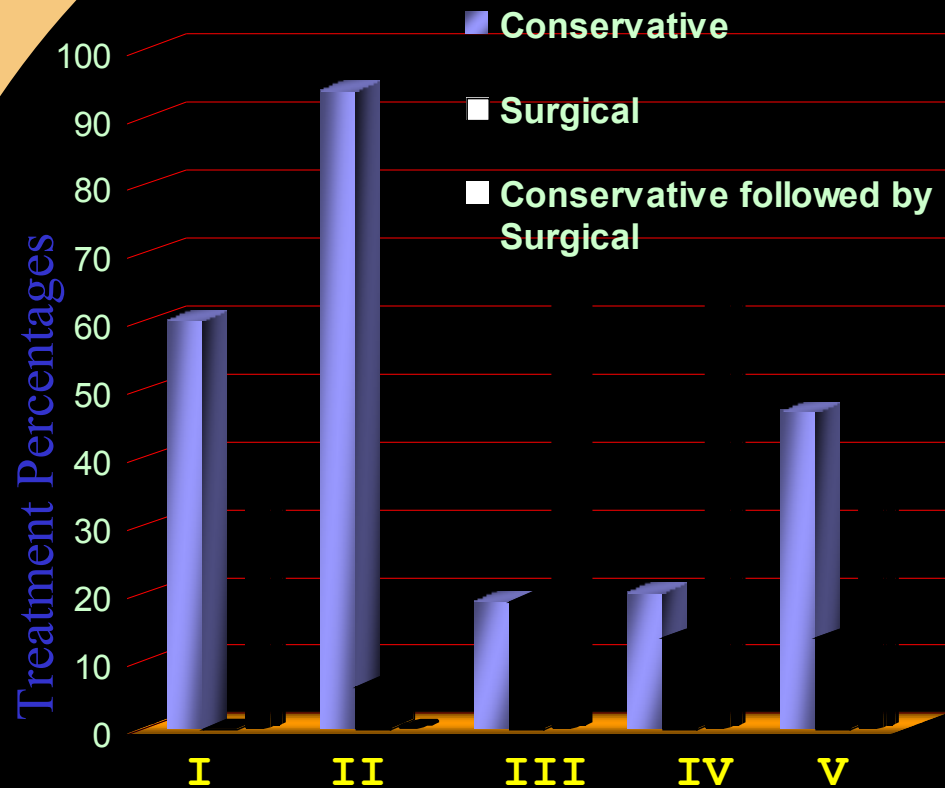


Conservative/Surgical Treatment of Spinal Injuries

- Grp-I cervical spine injuries
- Grp-II thoracic spine injuries
- Grp-III thoracolumbar spine injuries
- Grp-IV lumbar spine injuries

conservative management

- ❖ Type I & II occipital condyle Injuries
- ❖ Stable Atlas fractures (majority)
- ❖ Type I & III Odontoid fractures
- ❖ Type I & II Traumatic Spondylolsthesis of C2

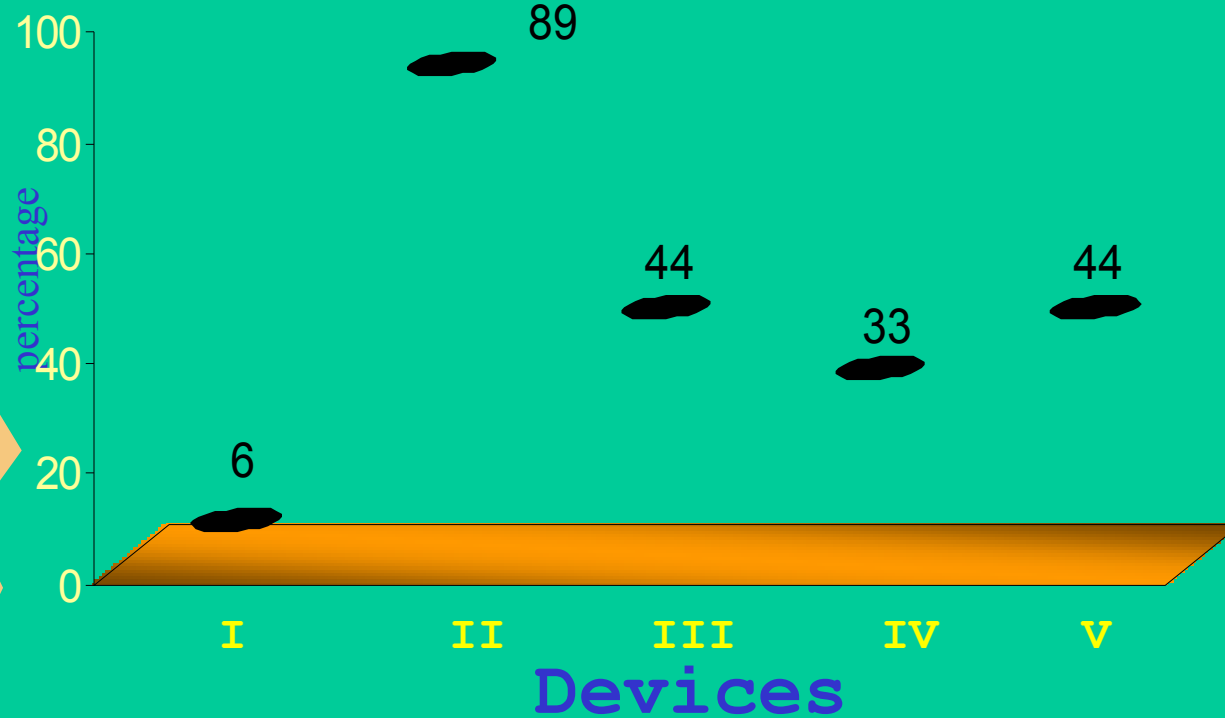


- I. Isolated C1 Fracture
- II. Odontoid type 1 fractures
- III. Odontoid type II fractures
- IV. Odontoid type III fractures
- V. Traumatic Spondylolsthesis of axi

management of C1 fracture

conservative management of cervical injuries

- ❖ Stage 1-4 compressive flexion injuries
- ❖ stage 1-2 vertical compression injuries with no neurological deficit
- ❖ distractive flexion injuries
- ❖ stage 1-3 compressive extension injuries
- ❖ stage 1 Distractive extension injuries
- ❖ stage 1 lateral flexion injuries

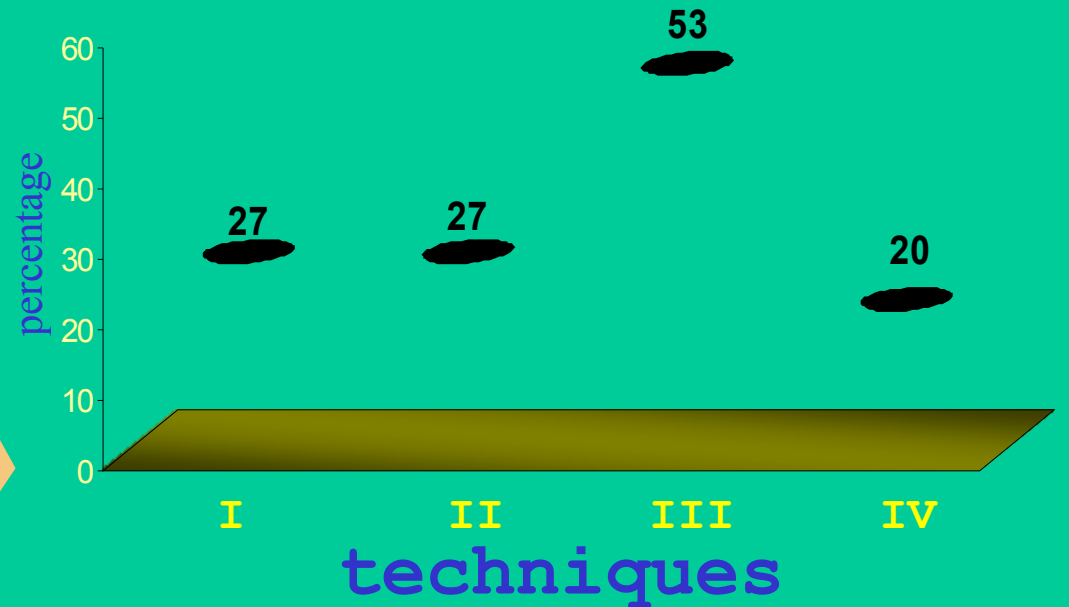


- I. Any Other (Specify)
- II. crutchfield tongs
- III. gardner well's tongs
- IV. halo ring
- V. head halter

devices used for conservative management of cervical spine injuries

conservative management of cervical injuries

- ❖ Reduction by traction through tongs / halo ring
- ❖ Tong traction no recommended in hyperextension injury
- ❖ Halo vest application

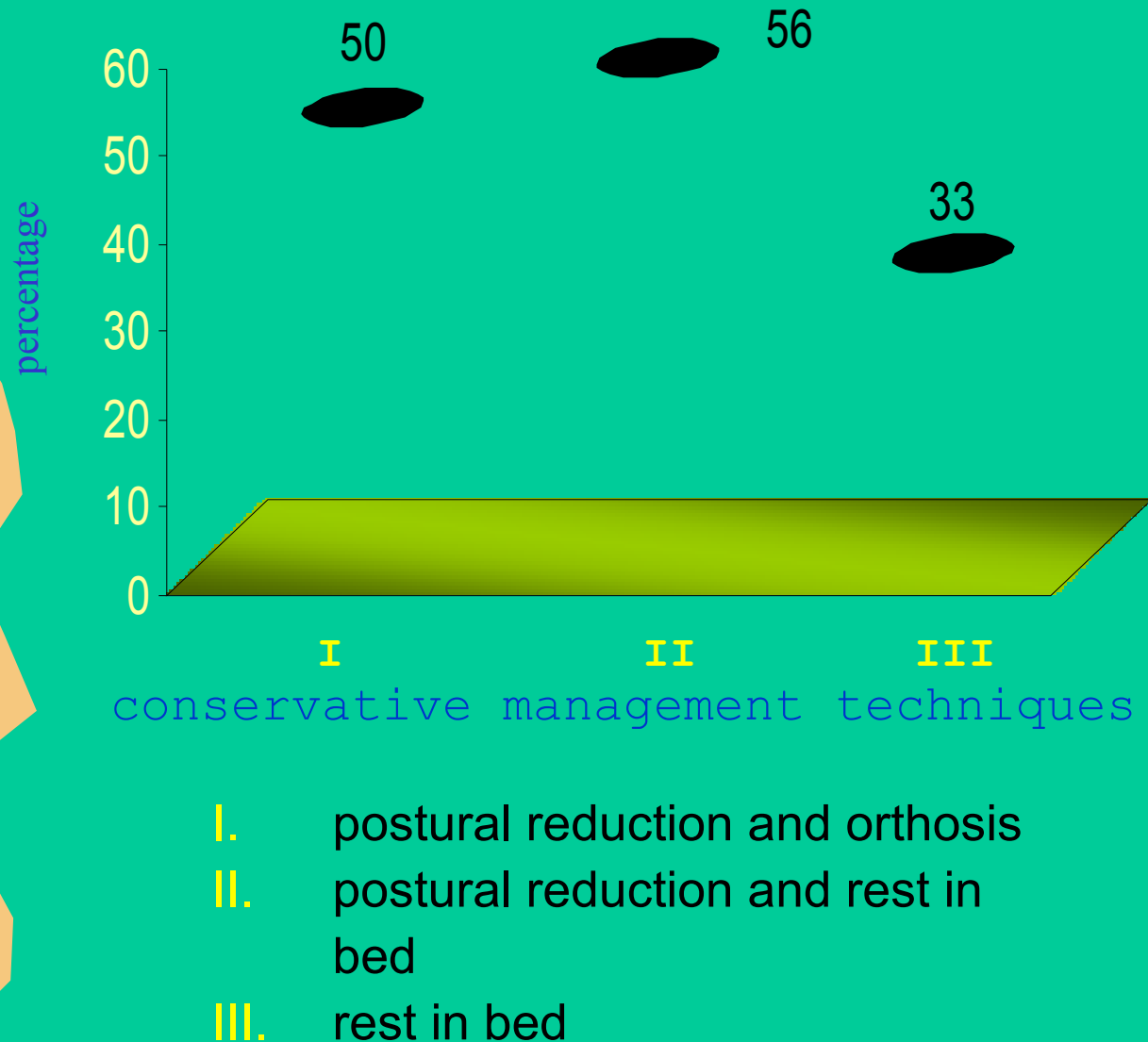


- I. closed reduction and immobilization in bed for 3 months
- II. closed reduction and mobilization with cervical collar
- III. closed reduction and mobilization with CTO
- IV. closed reduction and mobilization with Halo

white paper on spinal injury management for opinion of the expert group

conservative management of thoracic, thoracolumbar & lumbar injuries

- ❖ Postural reduction and orthosis
- ❖ Suitable for:
 - patients with no neurological deficit,
 - less than 20 degrees relative Kyphosis,
 - less than 50% compression



white paper on spinal injury management for opinion of the expert group

spinal fusion without internal fixation

- Rarely indicated
- May be employed in chronic stable injuries when correction of deformity or spinal re-alignment is not desirable

role of surgical decompression in neurological outcome

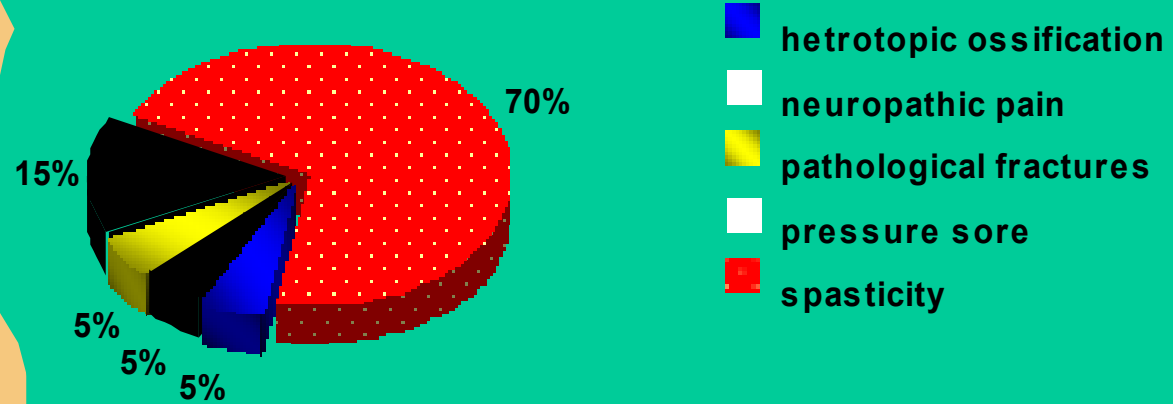
- ❖ Contradicting views in various studies
- ❖ Less controversy regarding incomplete injuries

role of surgical decompression

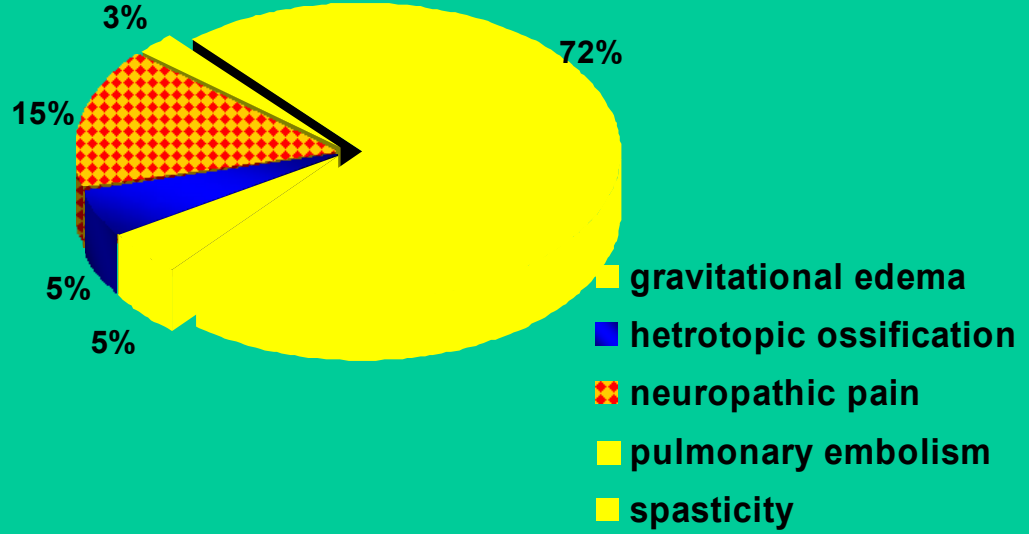
in Reducing Systemic Complications

❖ No clear cut consensus

Incidence of complications in conservatively treated patients



incidence of complications in surgically treated patients



role of timing of surgery in neurological outcome

- ❖ No clear cut consensus
- ❖ Experimental data favours early surgery
- ❖ Subluxation and locked facets easiest to reduce early
- ❖ Contradicting results in various studies

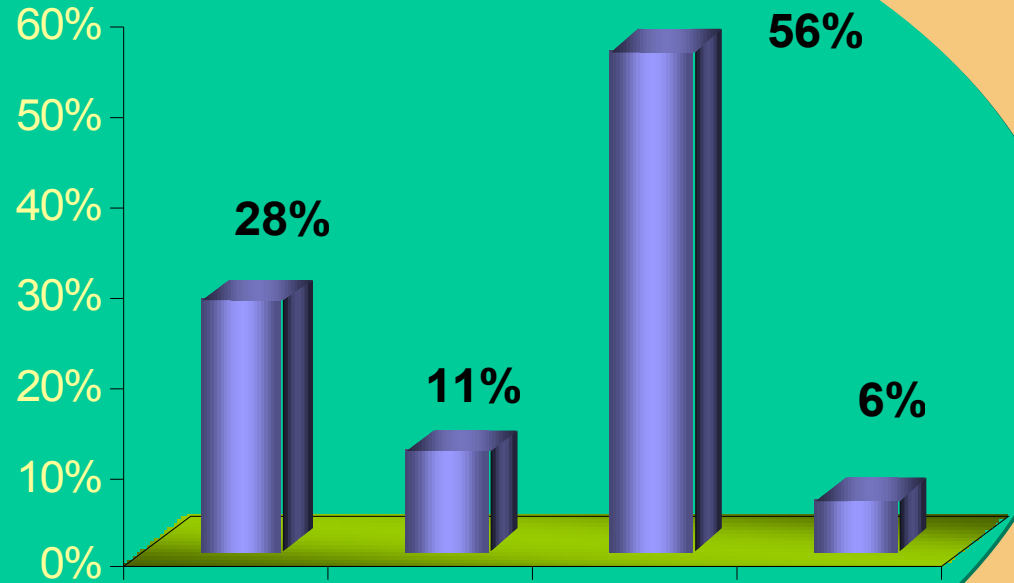
role of timing of surgery in reducing systemic complications

- ❖ No consensus amongst different studies
- ❖ Contradicting results in various studies

timing of surgery

timing of surgery for spinal injury

❖ Should be done only after the patient is stable and other associated conditions warranting priority treatment have been dealt with



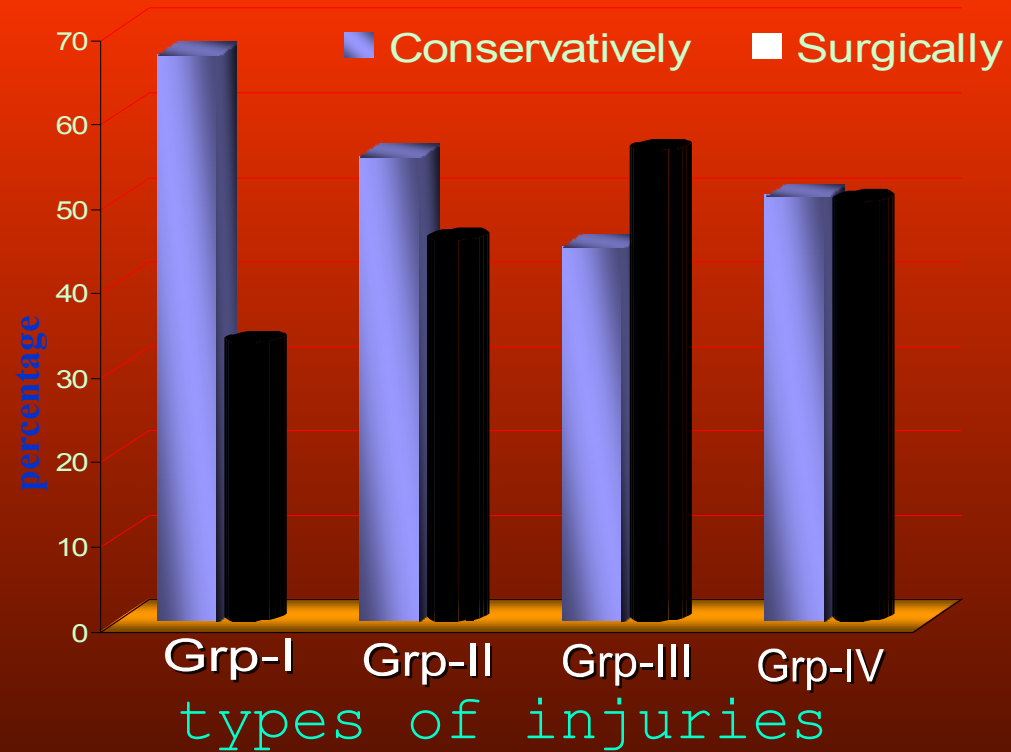
after 24 hrs but before 5 days of injury
after 5 days of injury
as soon as the patient is stable
within 24 hrs of injury

white paper on spinal injury management for opinion of the expert group

surgical management of spinal injuries

recommendations

- ❖ Indicated in all unstable injuries. In unstable burst fractures however conservative management could be an option and should be offered to the patients.
- ❖ Would help in allowing early mobilization and rehabilitation, restoring spinal alignment, diminishing the chance of Pseudarthrosis and restoring spinal stability.
- ❖ Strongly recommended in our country because of paucity of nursing personnel and care given by untrained relatives/ inadequate and unsuitable management environments.



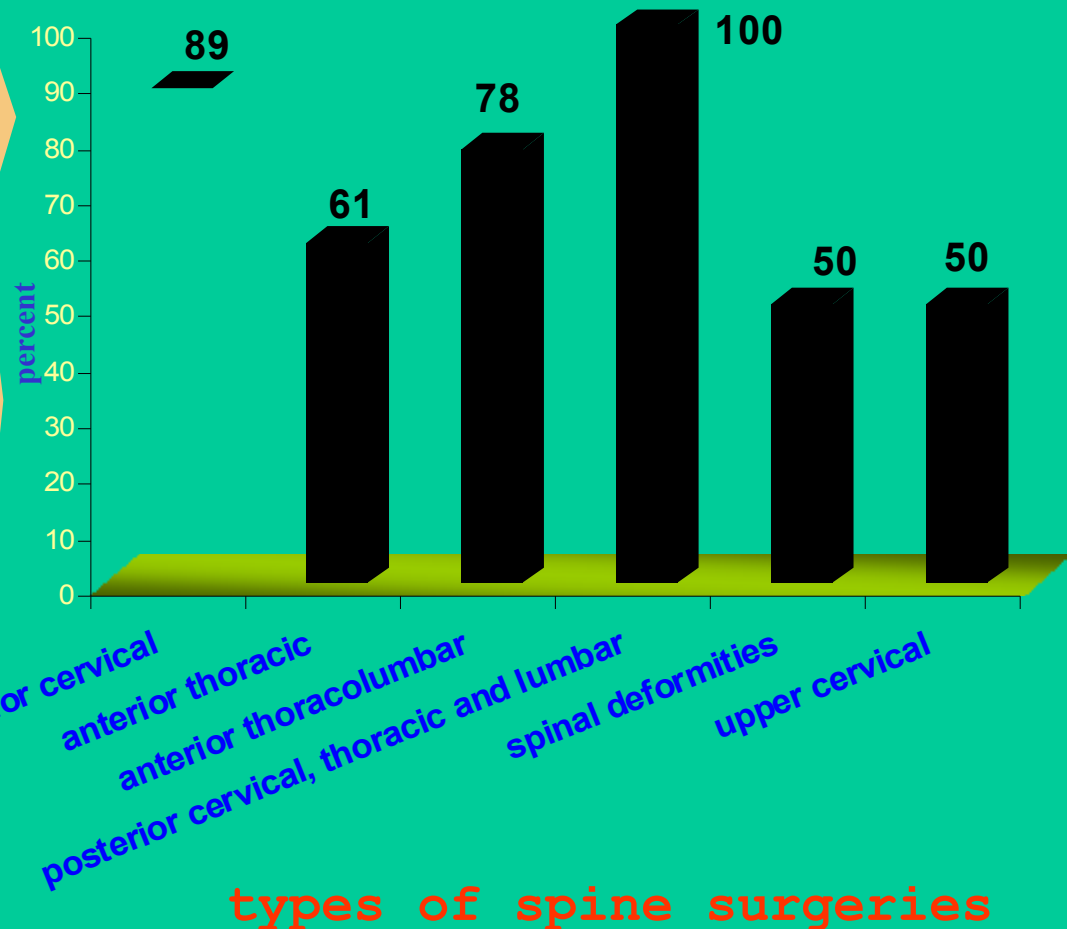
Conservative/Surgical Treatment of Spinal Injuries

- Grp-I cervical spine injuries
- Grp-II thoracic spine injuries
- Grp-III thoracolumbar spine injuries
- Grp-IV lumbar spine injuries

indications for anterior surgical approach

- ❖ Ventral compression
- ❖ Incomplete injuries may be more suitable
- ❖ Indicated more often in the cervical spine
- ❖ Improvement of motor root function claimed even in complete injuries

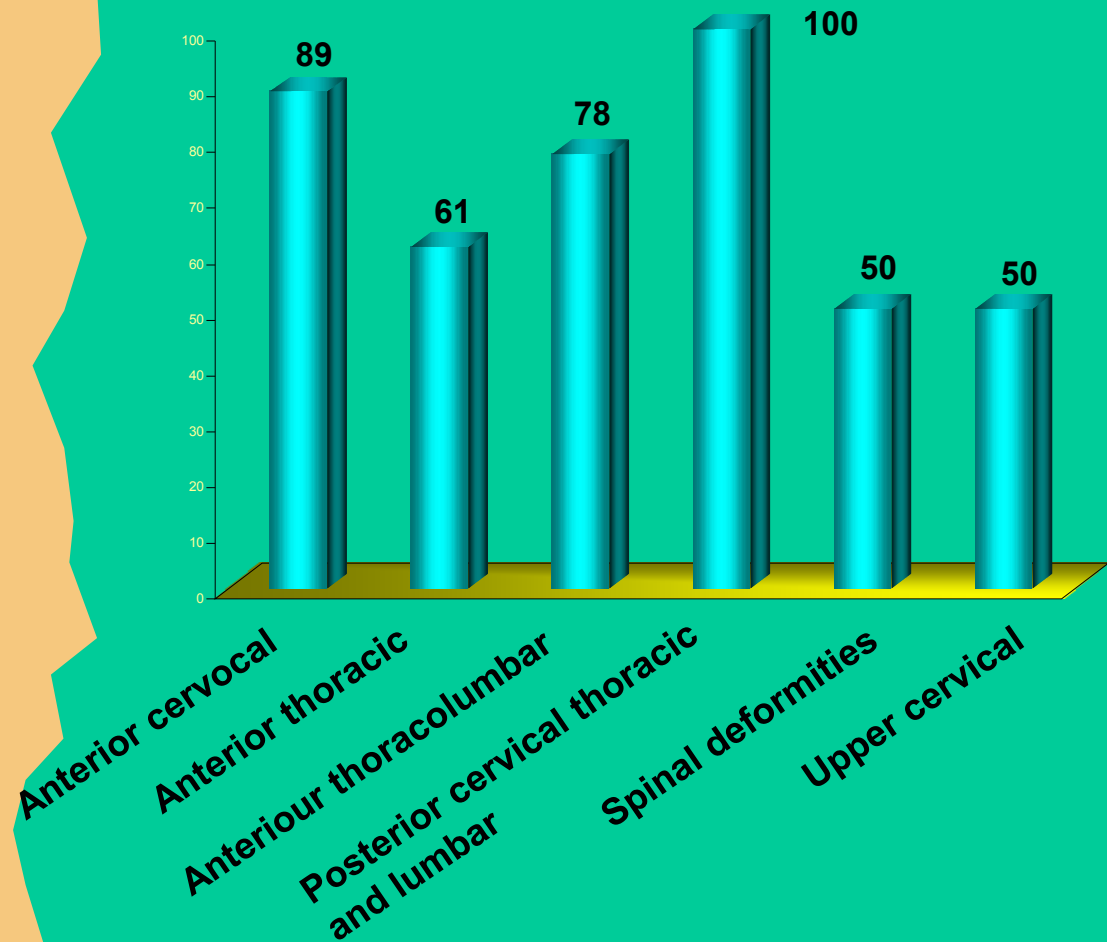
most common spine surgeries done



indications for posterior surgical approach

- ❖ Posterior compression
- ❖ Instability resulting from bony and ligamentous structures
- ❖ Used more often in thoracic, thoracolumbar and lumbar injuries

most common spine surgeries done



types of spine surgeries

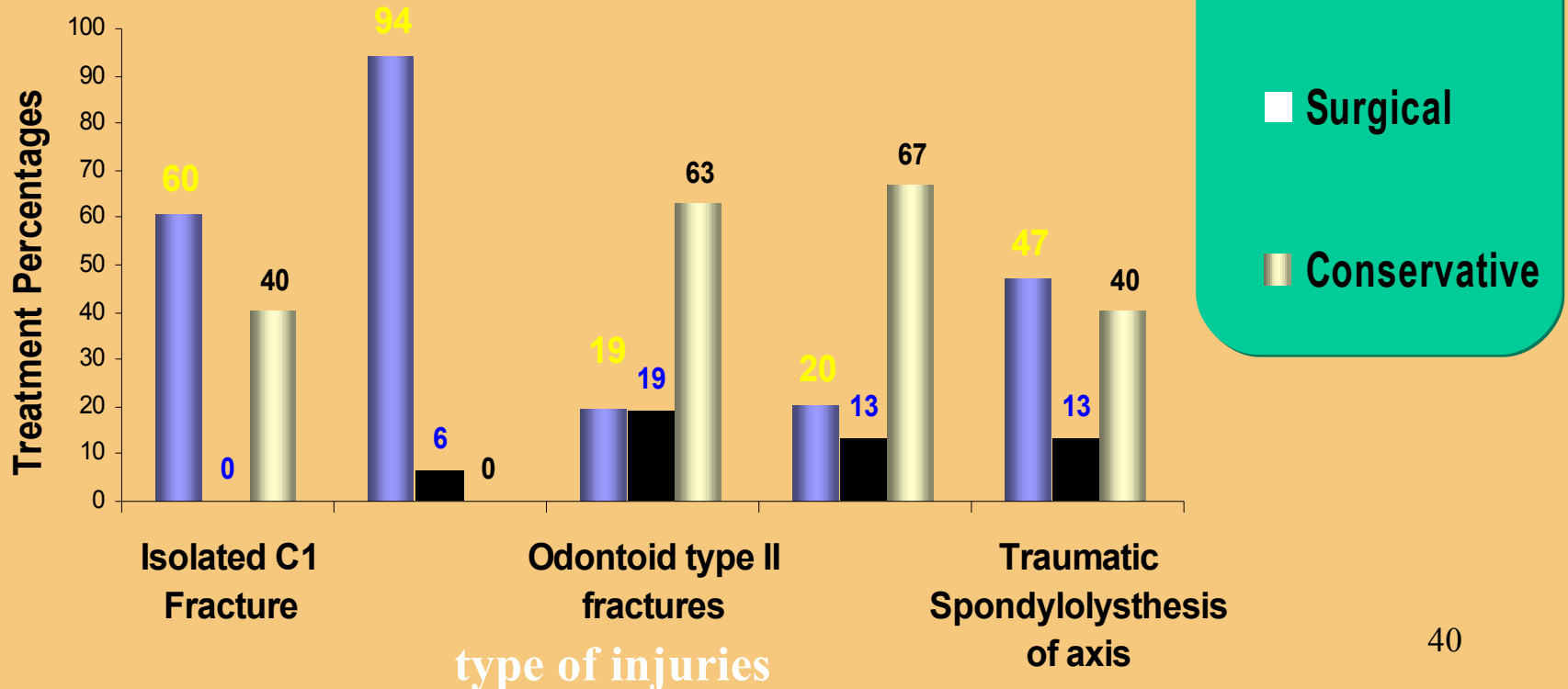
indications for combined surgical approach

- ❖ 3 column spinal disruption
- ❖ Posterior ligamentous disruption or facet fracture and simultaneous anterior compression or a herniated disc

surgical management of upper cervical spine injuries

- ❖ Posterior occipito cervical fusion
 - Type III Occipital Condyle injuries,
 - Atlanto-Occipital subluxation/dislocation.

Management of C1 Fracture



surgical management of upper cervical spine injuries

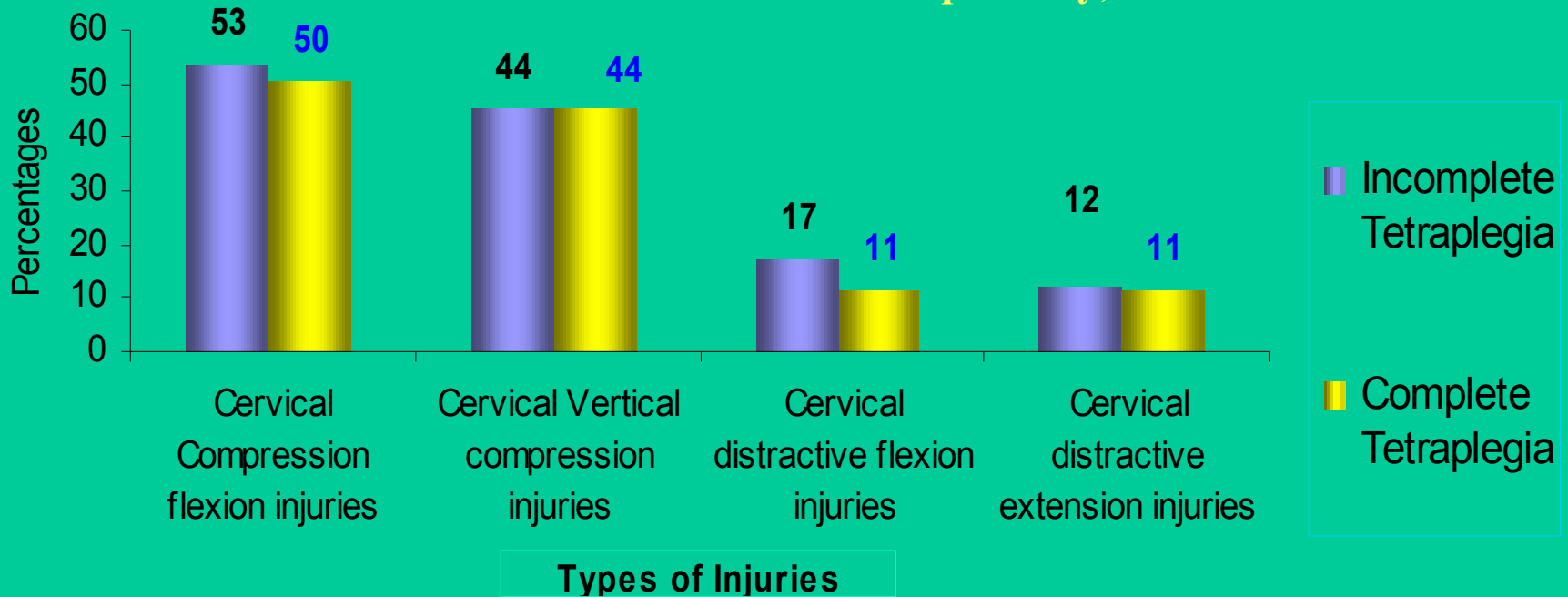
- ❖ Brooks C1-C2 fusion
 - Unstable Atlas fractures (rare),
 - Type II odontoid fractures with risk factors for non union,
 - Traumatic Atlantoaxial instability
- ❖ Posterior C2-C1 facet screw fixation (Magerl techniques)
 - Indications of Brooks C1-C2 fusion with incompetent posterior arch of C1,
 - Type III traumatic spondylolisthesis of C2 (with extension of plating to C3 lateral mass)

surgical management of lower cervical spine injuries

Anterior corpectomy and fusion with instrumentation

- Stage 5 and unstable stage 3-4 compressive flexion injuries,
- Vertical compression injuries with neurological deficit,
- Distractive flexion injuries with unsuccessful closed reduction or neurological worsening during reduction or with significant disc herniation after reduction,
- Stage 2 distractive extension injuries.

Anterior Corpectomy, fusion and fixation

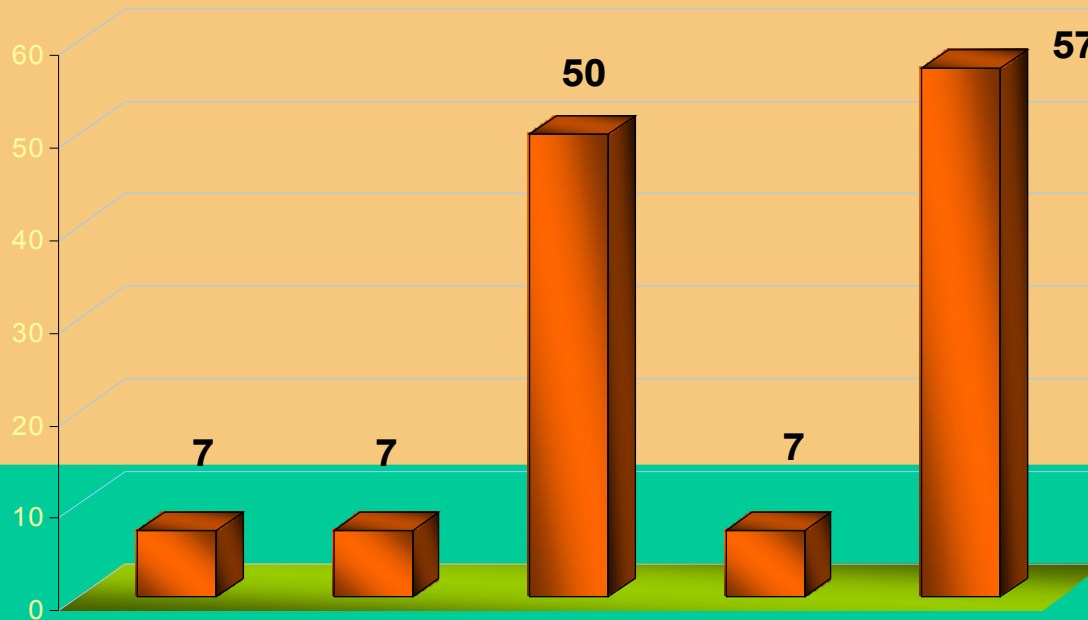


surgical management of lower cervical spine injuries



Reduction and stabilisation with posterior cervical approach

- Irreducible distraction flexion injuries,
- Stage 4-5 compressive extension injuries,
- Stage 2 lateral flexion injuries.



techniques
for posterior
stabilization
of cervical
spine

bohlman's
triple wire
technique

according to
intactness of
posterior bony
structure

lateral
mass
plating

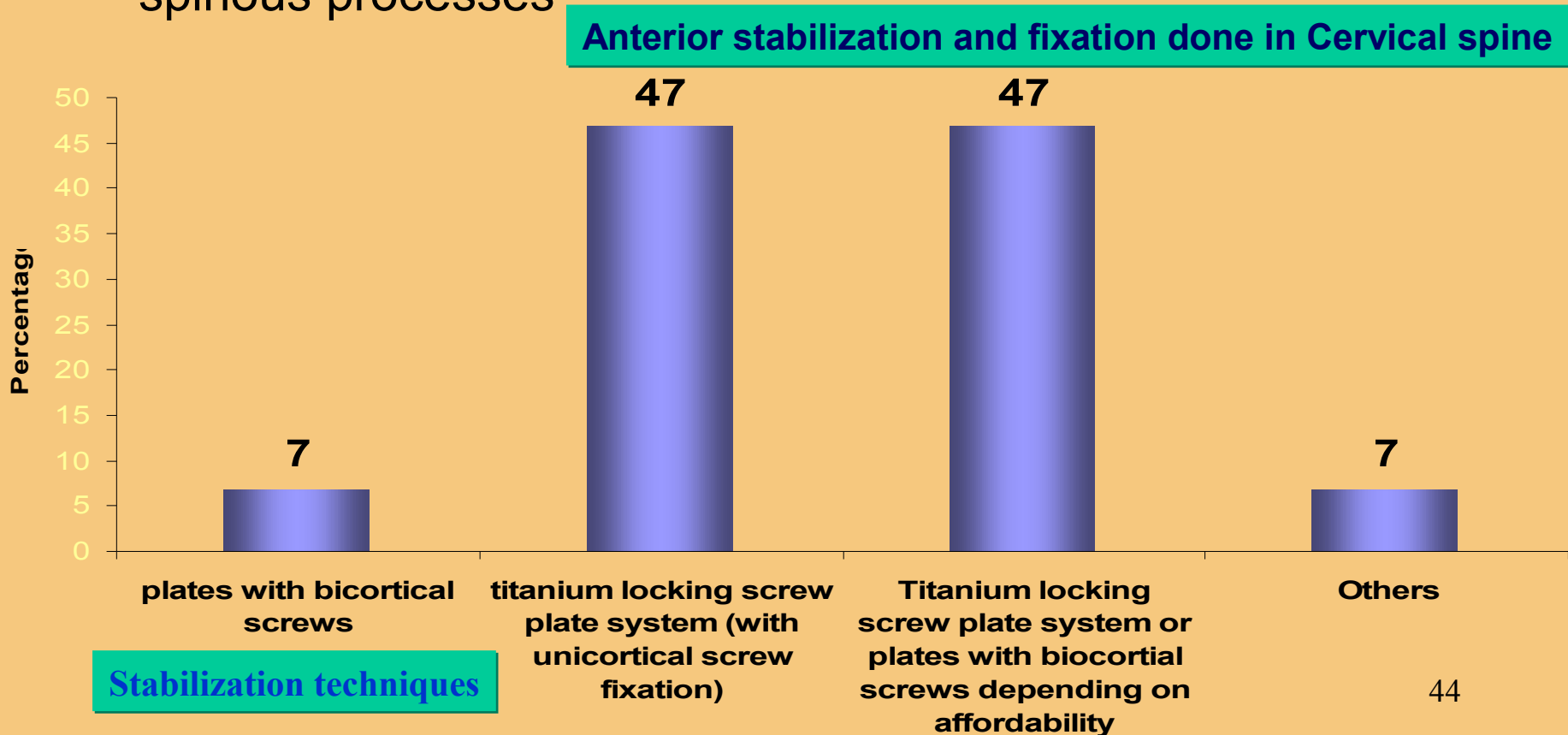
roger's
wiring
technique

sublaminar wiring
technique

Stabilization techniques

instrumentation in cervical spine surgery

- ❖ Locking screw plate system preferable in Anterior Cervical Spine Fixation
- ❖ Interior Spinous Wiring by Bohlman Triple wire technique an efficient one for posterior fixation
- ❖ Lateral mass fixation in those cases with fracture of lamina or spinous processes



surgical management of thoracic, thoracolumbar & lumbar spinal injuries

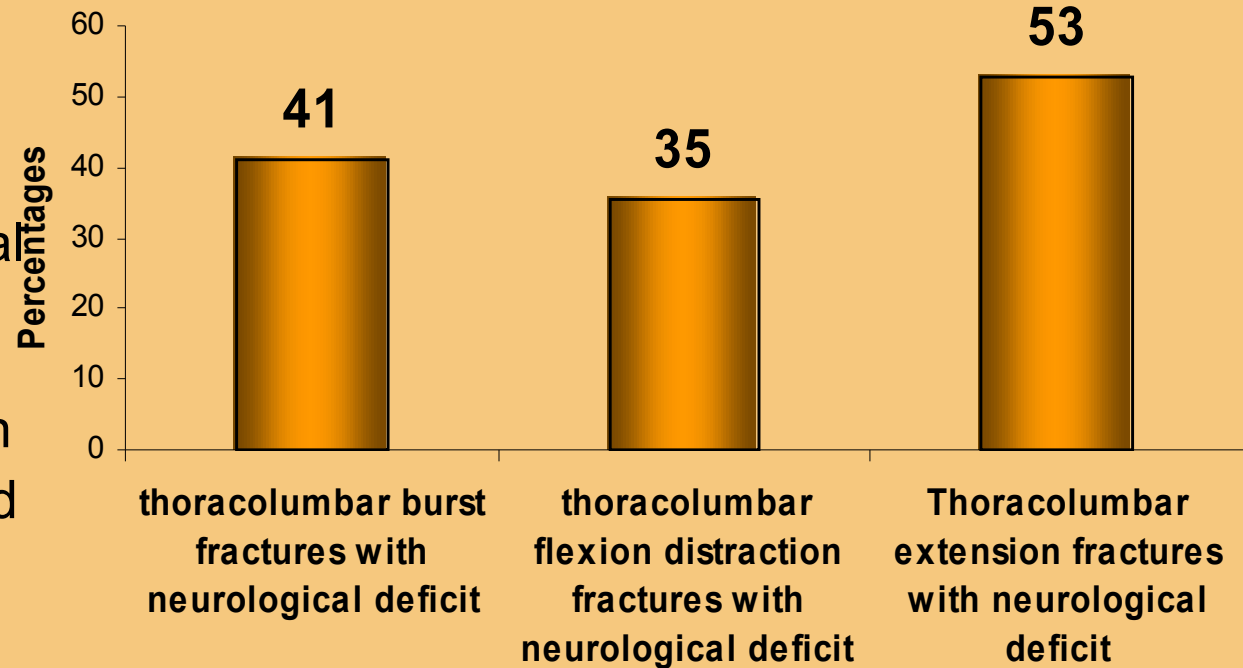
posterior direct decompression

❖ Posterior Laminectomy

Indications:

- Comminuted posterior elements causing direct neural compression
- Epidural hematoma requiring evacuation
- Repair of associated dural tears

laminectomy for management of thoracolumbar spine injuries



Thoracolumbar Spine Injuries

white paper on spinal injury management for opinion of the expert group

surgical management of thoracic, thoracolumbar & lumbar spinal injuries

posterior direct decompression

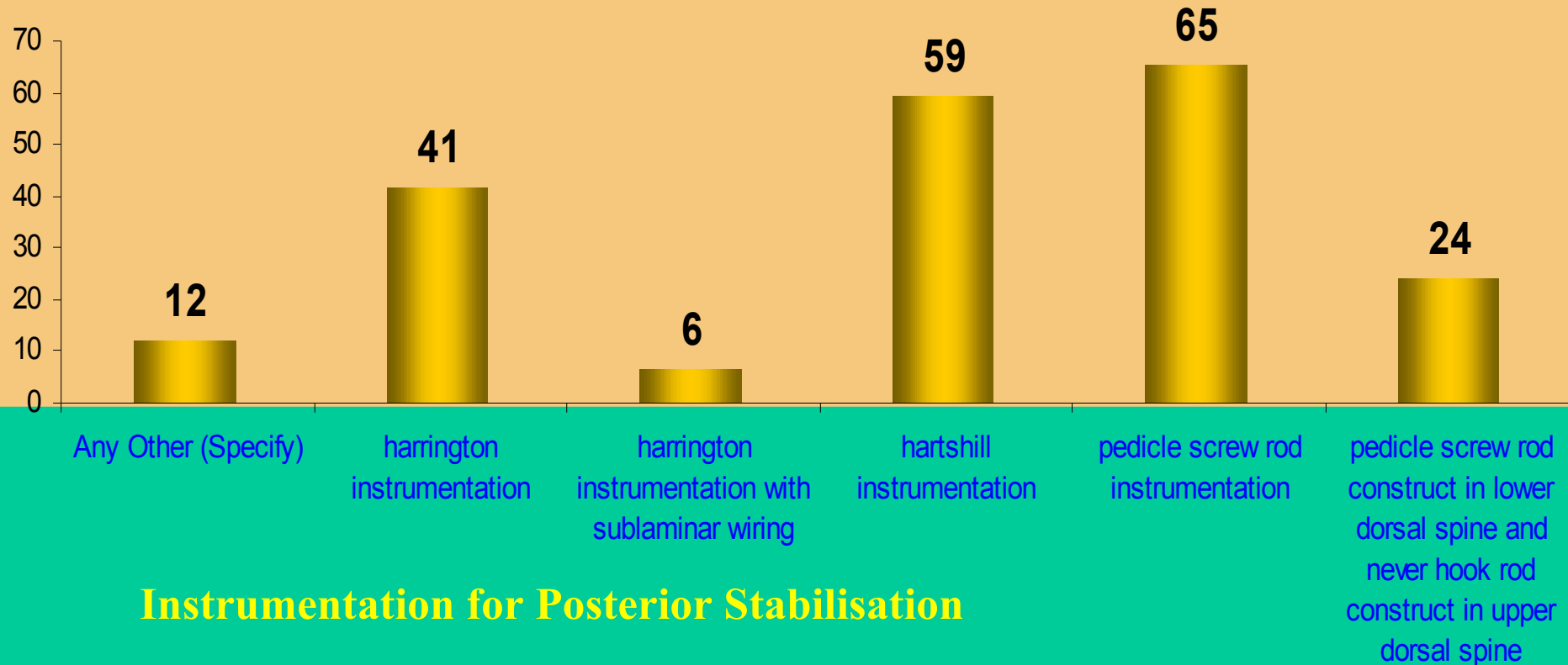
Postero lateral decompression

- Best performed in the lower lumbar spine below the conus.

surgical management of thoracic, thoracolumbar & lumbar spinal injuries

Posterior Indirect Decompression

- ❖ Distraction Instrumentation (Harrington Instrumentation)
 - if PLL, ALL & annulus are disrupted distraction without reduction may lead to tensioning of cord over fragment
 - Increased length of instrumentation required – five to six motion segments
 - Flat back syndrome
 - Hook cut out due to high stress at hook lamina junction

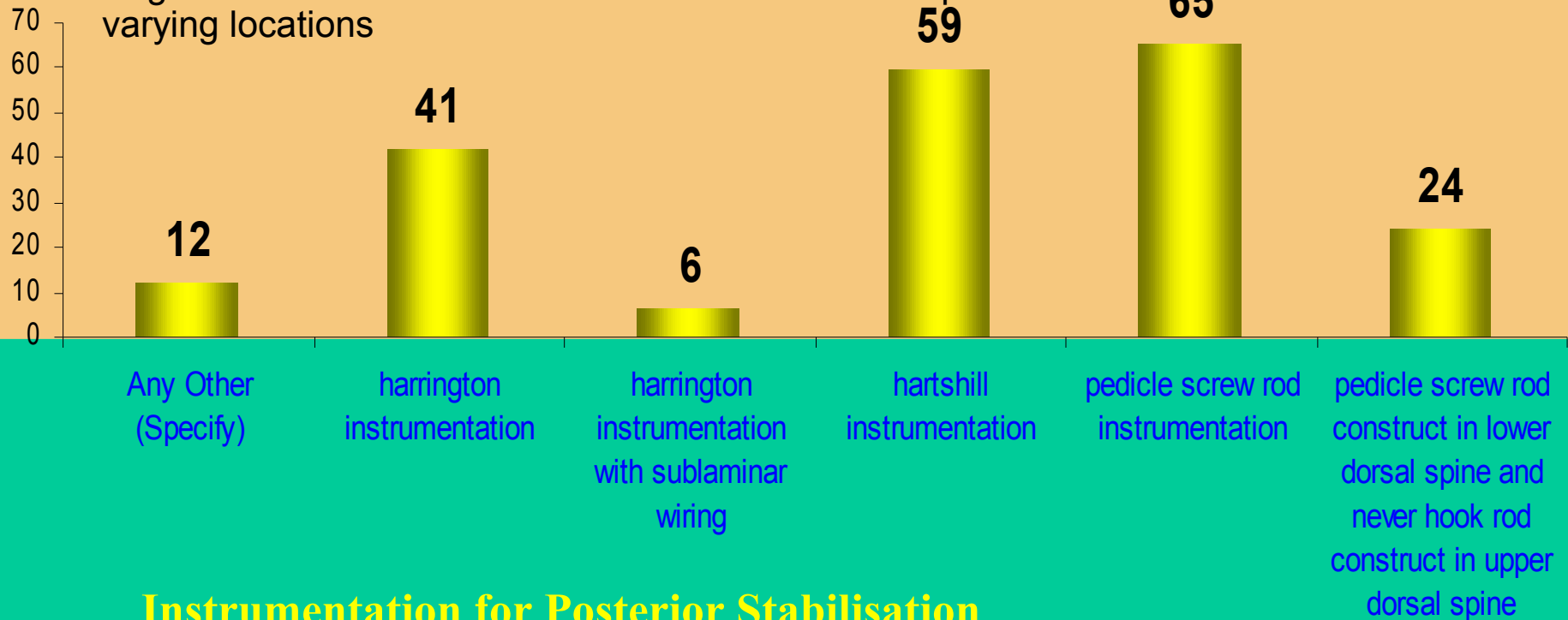


surgical management of thoracic, thoracolumbar & lumbar spinal injuries

Posterior Indirect Decompression

Posterior segmental fixation

- Luque construct restores 50% of rotational stiffness but is unable to maintain or provide corrective distraction or compressive forces
- Harri-luque technique improves rotational torsional control
- Segmental hook rod construct allows individual compression or distraction forces at varying locations



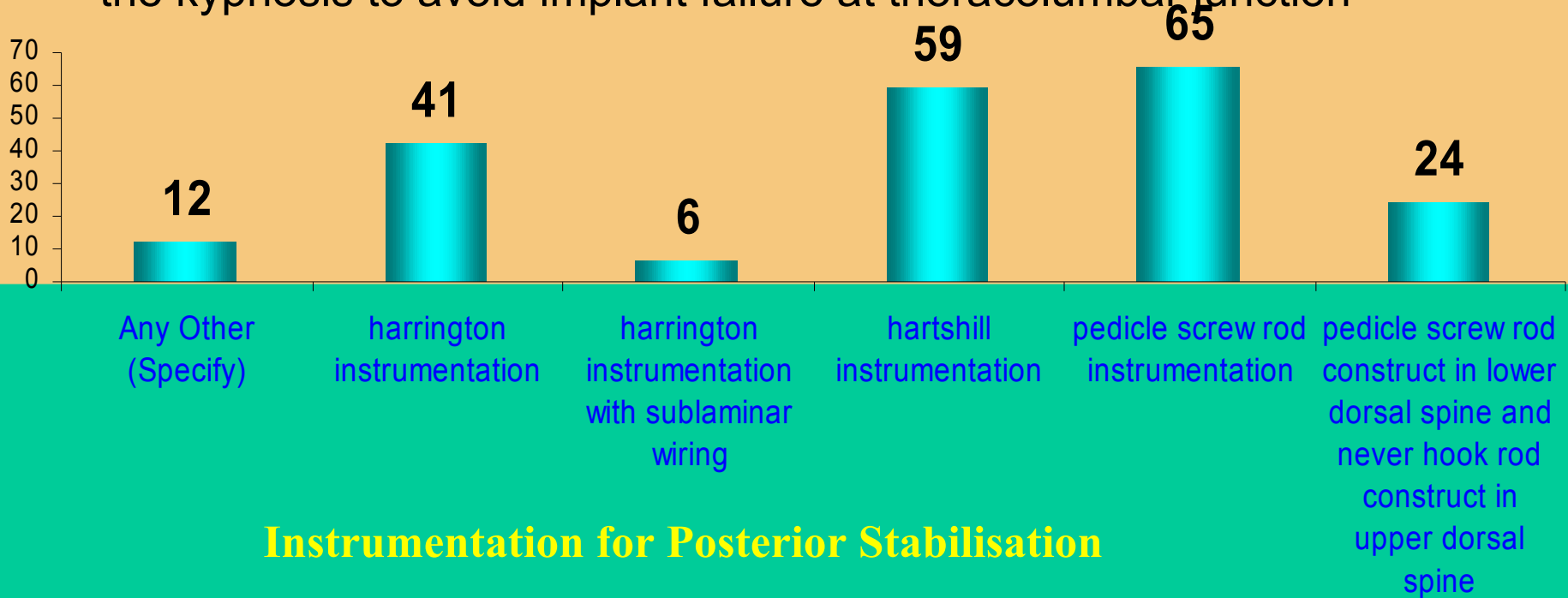
Instrumentation for Posterior Stabilisation

surgical management of thoracic, thoracolumbar & lumbar spinal injuries

Posterior Indirect Decompression

Pedicle Screw segmental instrumentation

- Rigid implant bone purchase allowing short segment fusions with preservation of motion segments
- Segmental pedicle fixation should be done two levels above the kyphosis to avoid implant failure at thoracolumbar junction

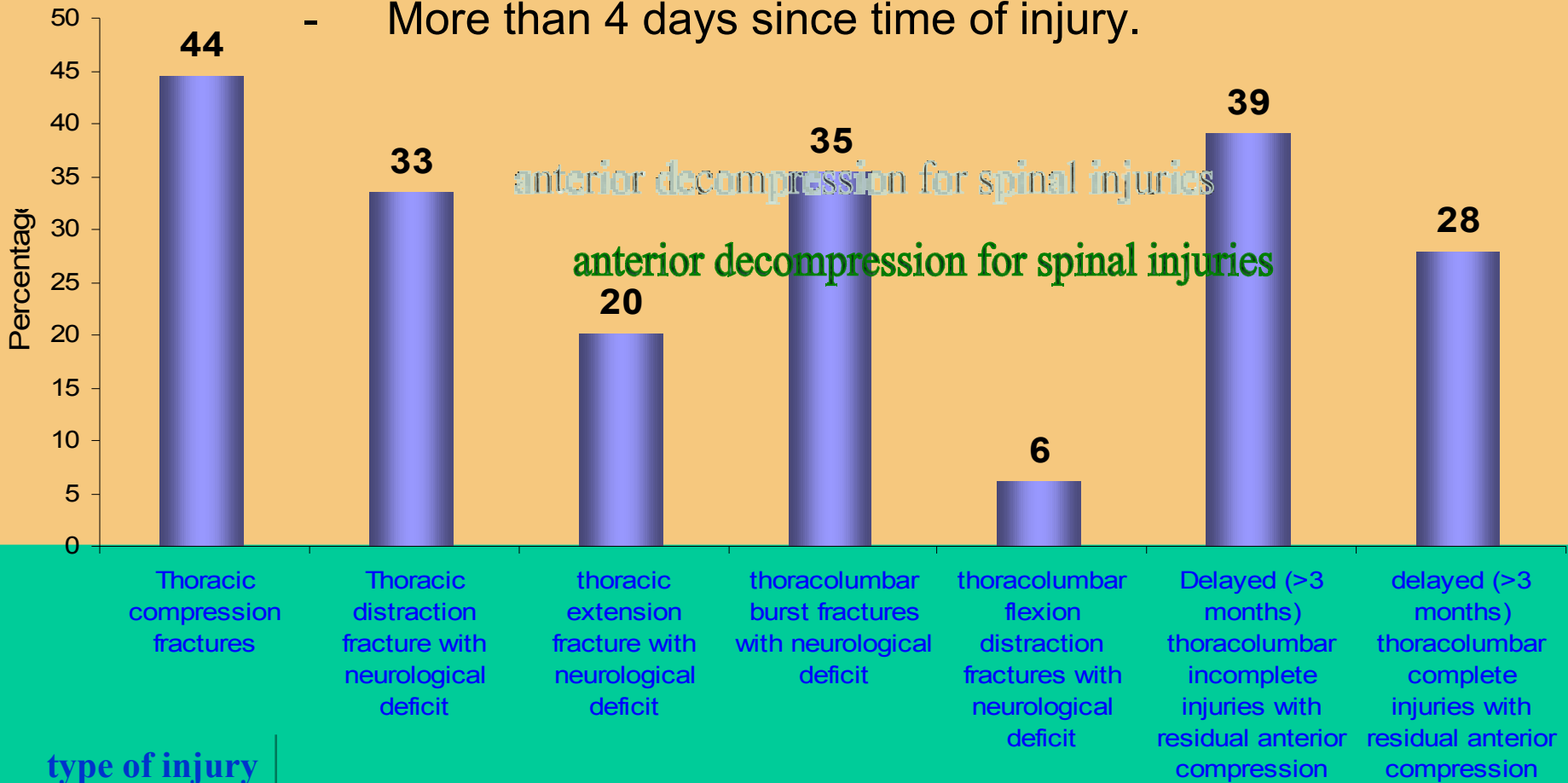


Instrumentation for Posterior Stabilisation

surgical management of thoracic, thoracolumbar & lumbar spinal injuries

Anterior decompression

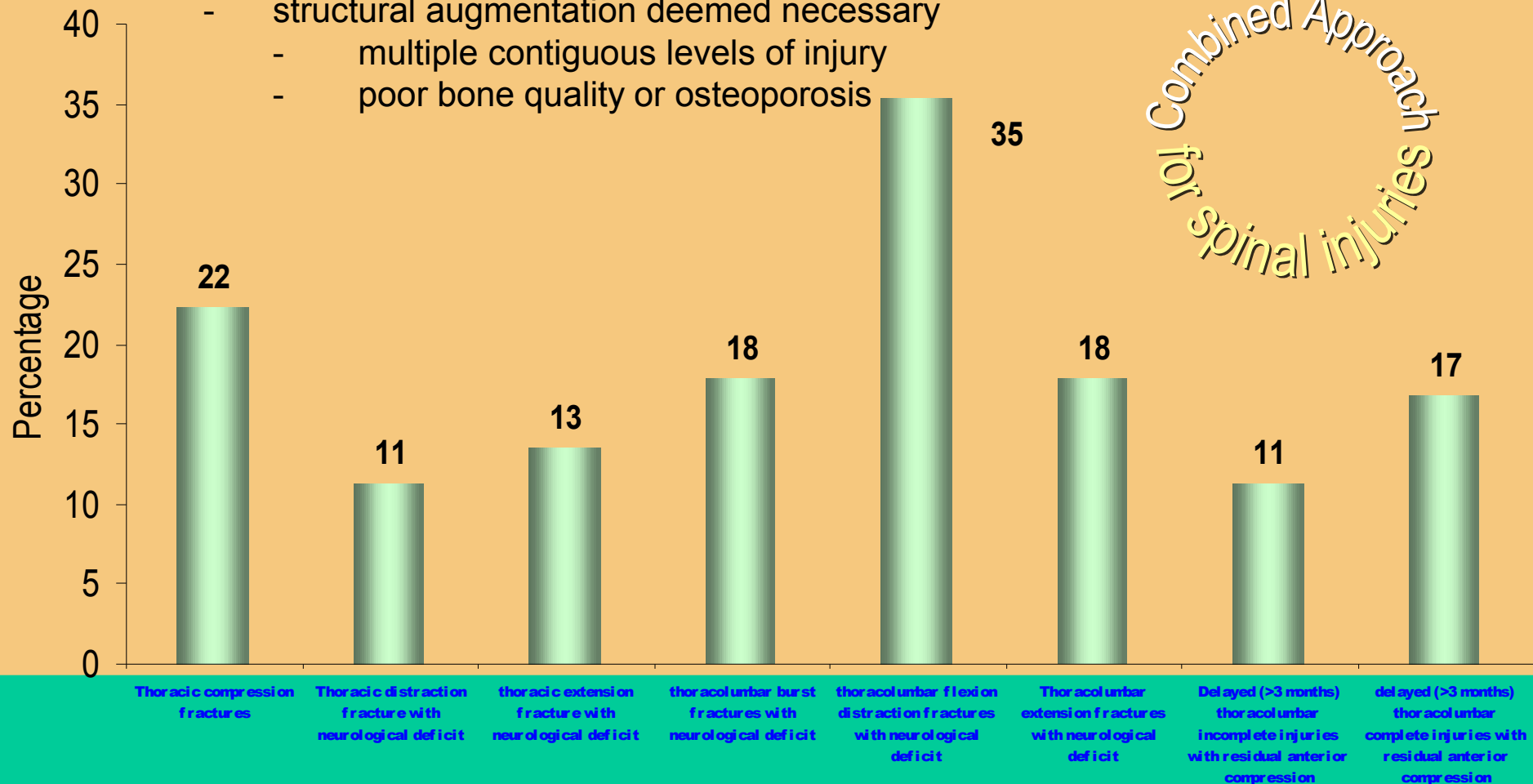
- Incomplete neurological deficit in a compression or flexion compression injury with marked canal compromise
- Anterior column communitation and marked kyphosis ($>30^\circ$)
- More than 4 days since time of injury.



surgical management of thoracic, thoracolumbar & lumbar spinal injuries

Combined Anterior and Posterior approach

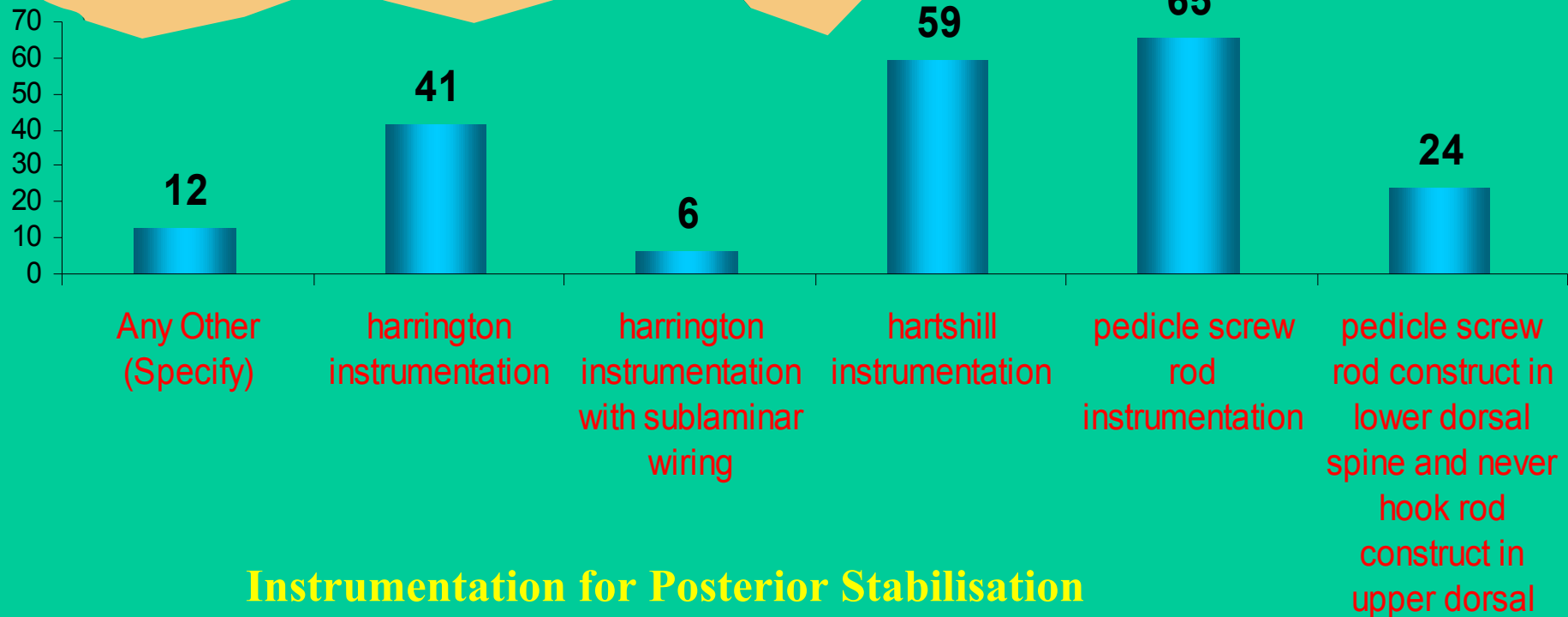
- canal compromised circumferentially
- severe coronal or saggital plane deformity ($>40^\circ$) requiring realignment or rebalancing
- structural augmentation deemed necessary
 - multiple contiguous levels of injury
 - poor bone quality or osteoporosis



instrumentation in thoracic spine surgery

recommendations

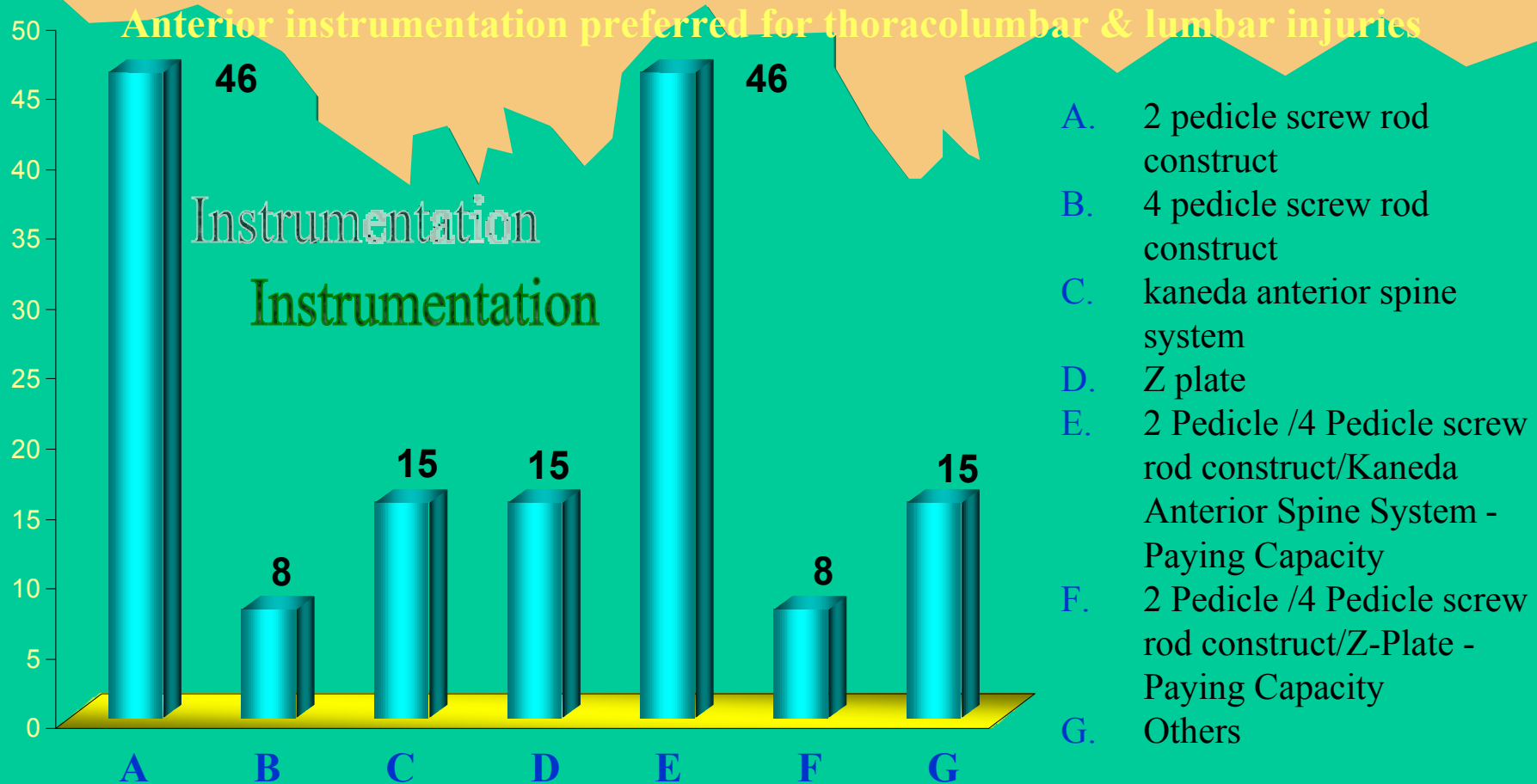
- ❖ Posterior fixation by Hook Rod Construct or pedicle screw rod construct
- ❖ Anterior instrumentation to be avoided in upper thoracic spine



Instrumentation for Posterior Stabilisation

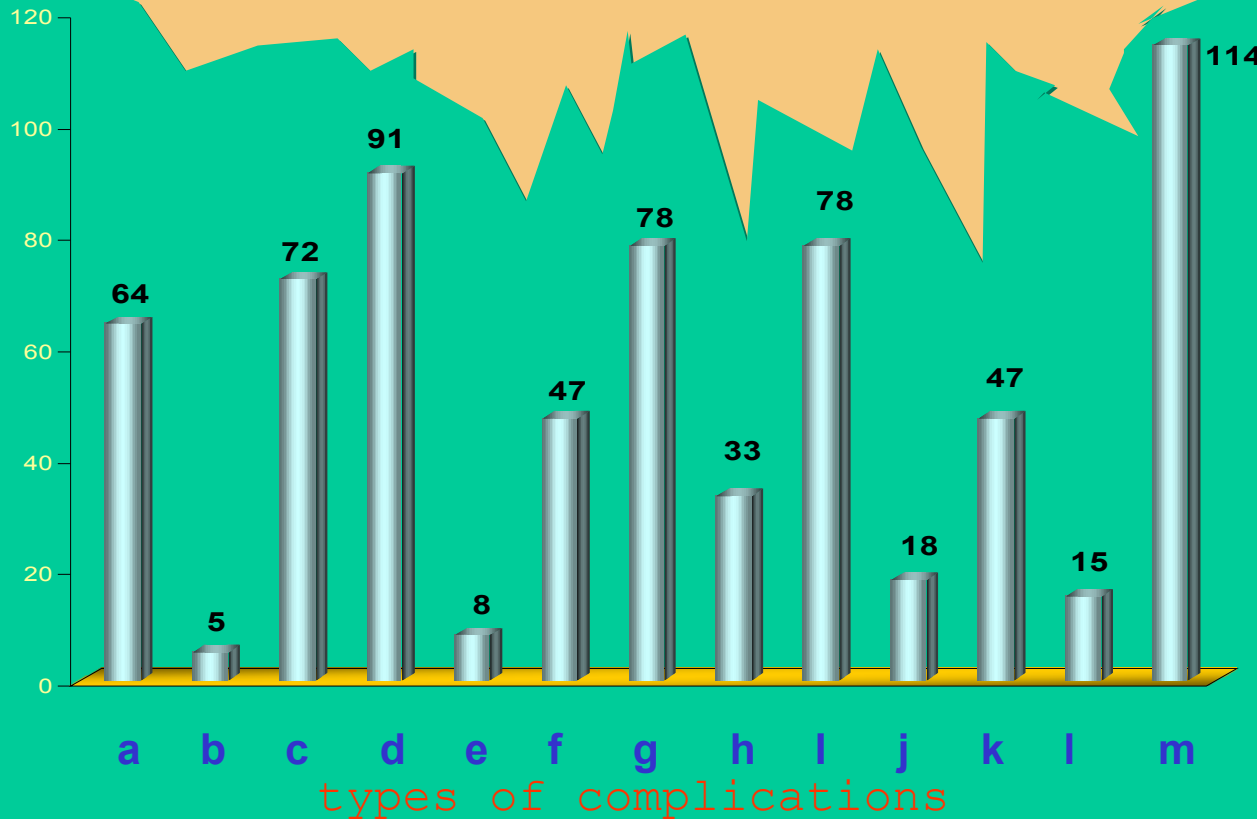
instrumentation in thoracolumbar spine surgery

- ❖ Pedicle Screw Rod Construct preferable **recommendations**
- ❖ Option of hook rod or sublaminar wire loop construct
- ❖ Anterior instrumentation by screw rod or screw plate construct



complications in spinal surgery

Complications in Spinal Surgery



- a. bone graft extrusion
- b. death
- c. deep infection
- d. dural tear and CSF leak
- e. great vessel injury
- f. implant pull out
- g. increased neurological deficit
(a) cord injury (b) nerve root injury
- h. late instability
- i. pedicle perforation
- j. post operative deformity
- k. pseudarthrosis
- l. recurrent laryngeal nerve injury
- m. superficial infection

bladder management

- ❖ Improperly managed bladder leads to bladder and renal complications and is still one of the commonest cause of morbidity and reduced lifespan

evaluation of neurogenic bladder

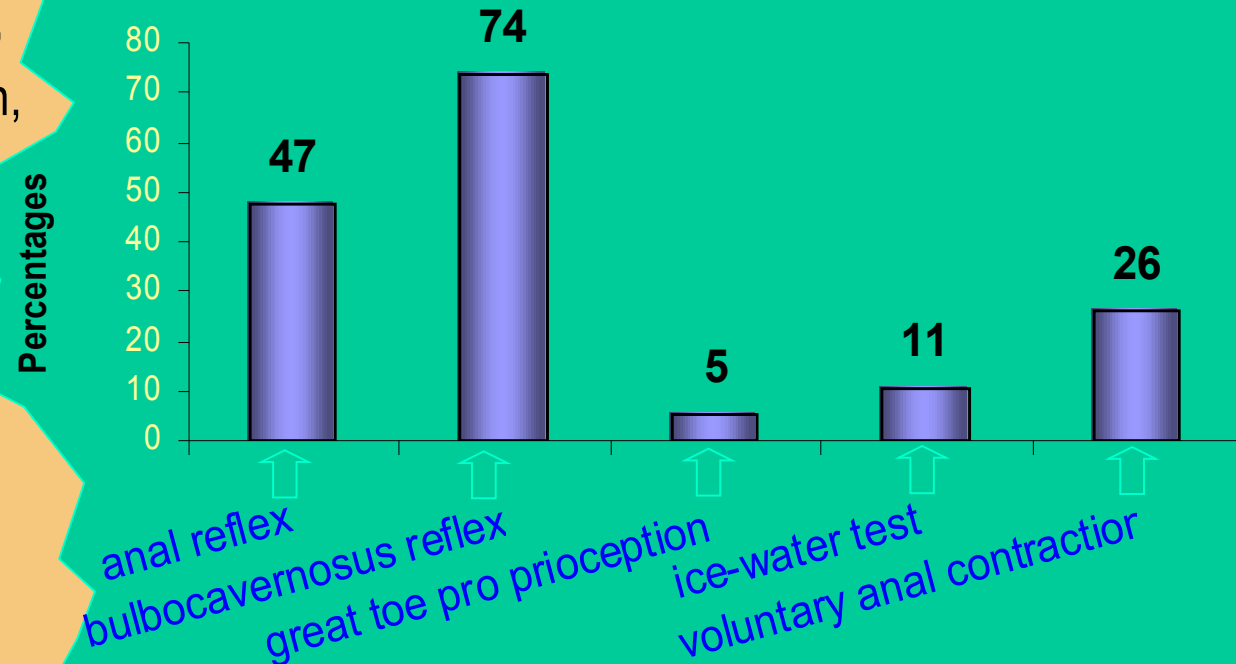
❖ Simple clinical tests

- Voluntary anal contraction,
- Bulbocavernosus reflex,
- Great toe proprioception,
- Anal reflex,
- Ice water test

❖ Baseline investigations

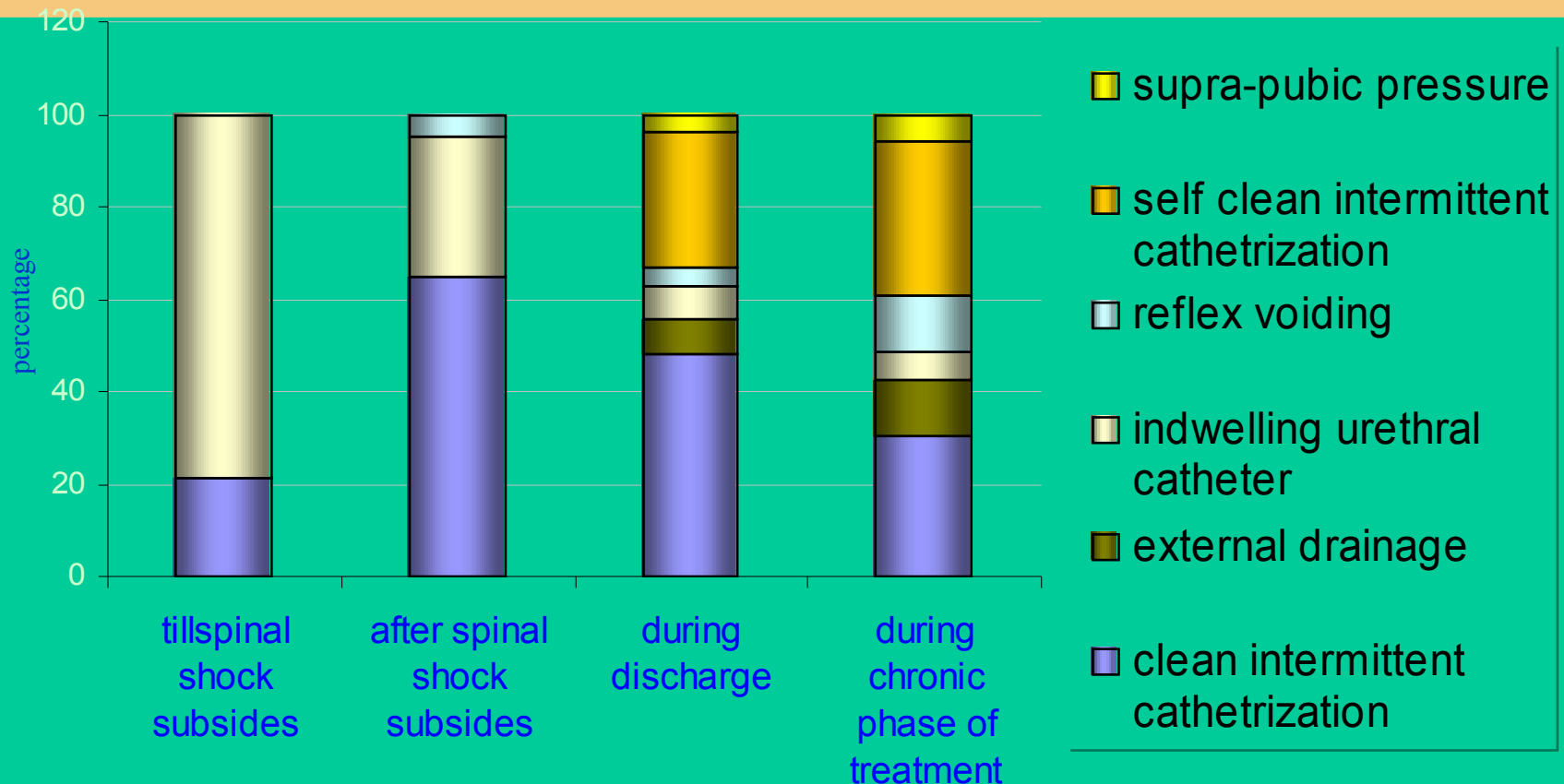
- ultrasound KUB
- urodynamics
(Videourodynamics or Urodynamics with MCU)

Relevant clinical examination for bladder management



modality of bladder management

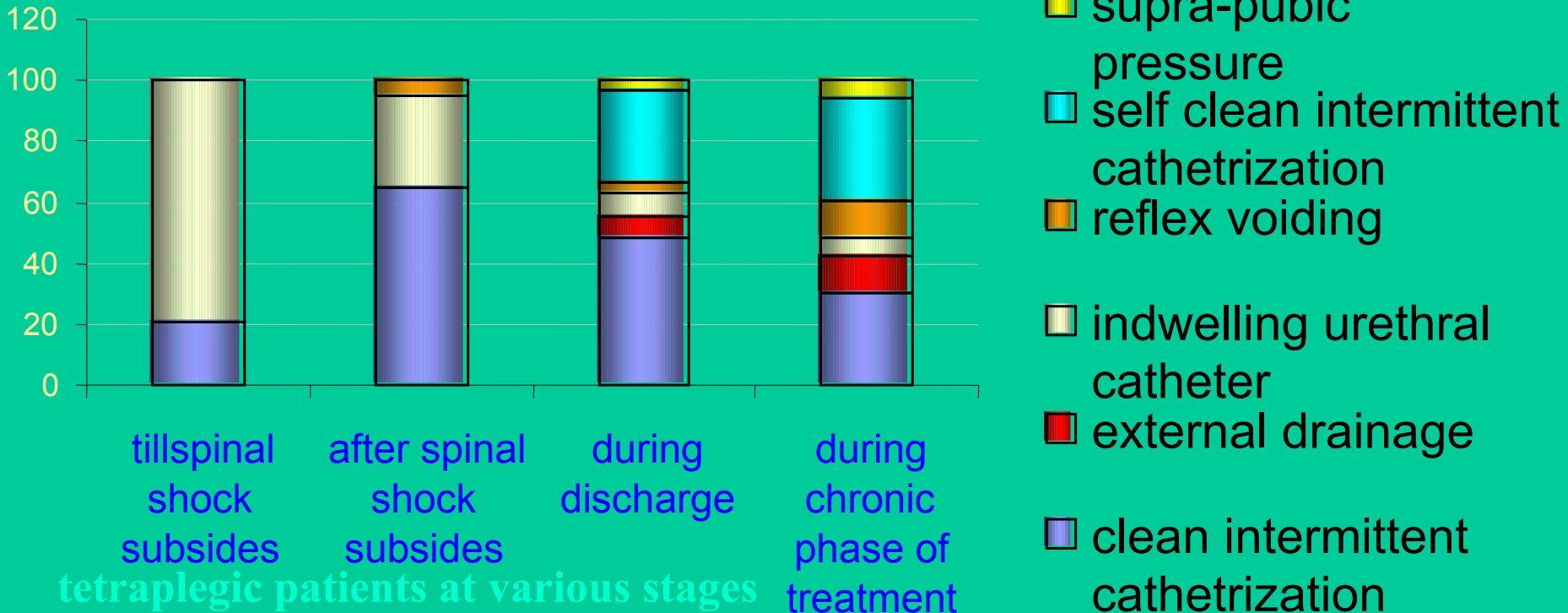
- Spinal Shock Phase - Indwelling catheter
- After Spinal Shock is over - Clean Intermittent catheterisation
- At varying period before discharge - Self Clean Intermittent Catheterisation
- At home - Self Clean Intermittent Catheterisation



modality of bladder management

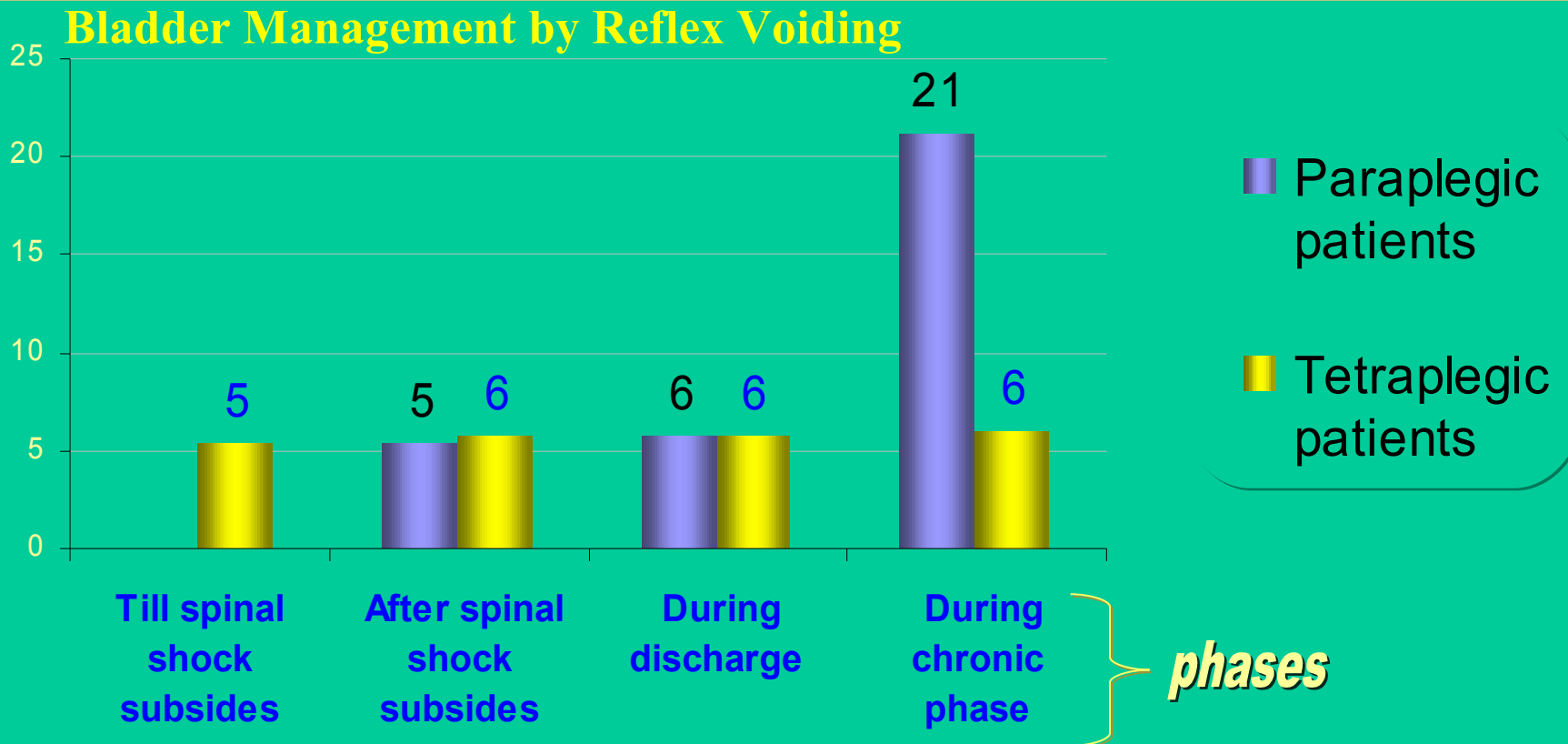
- ❖ Tetraplegic and female patients require separate considerations
 - indwelling Suprapubic catheter an option

Modality of bladder management in tetraplegic patients



bladder management by reflex voiding

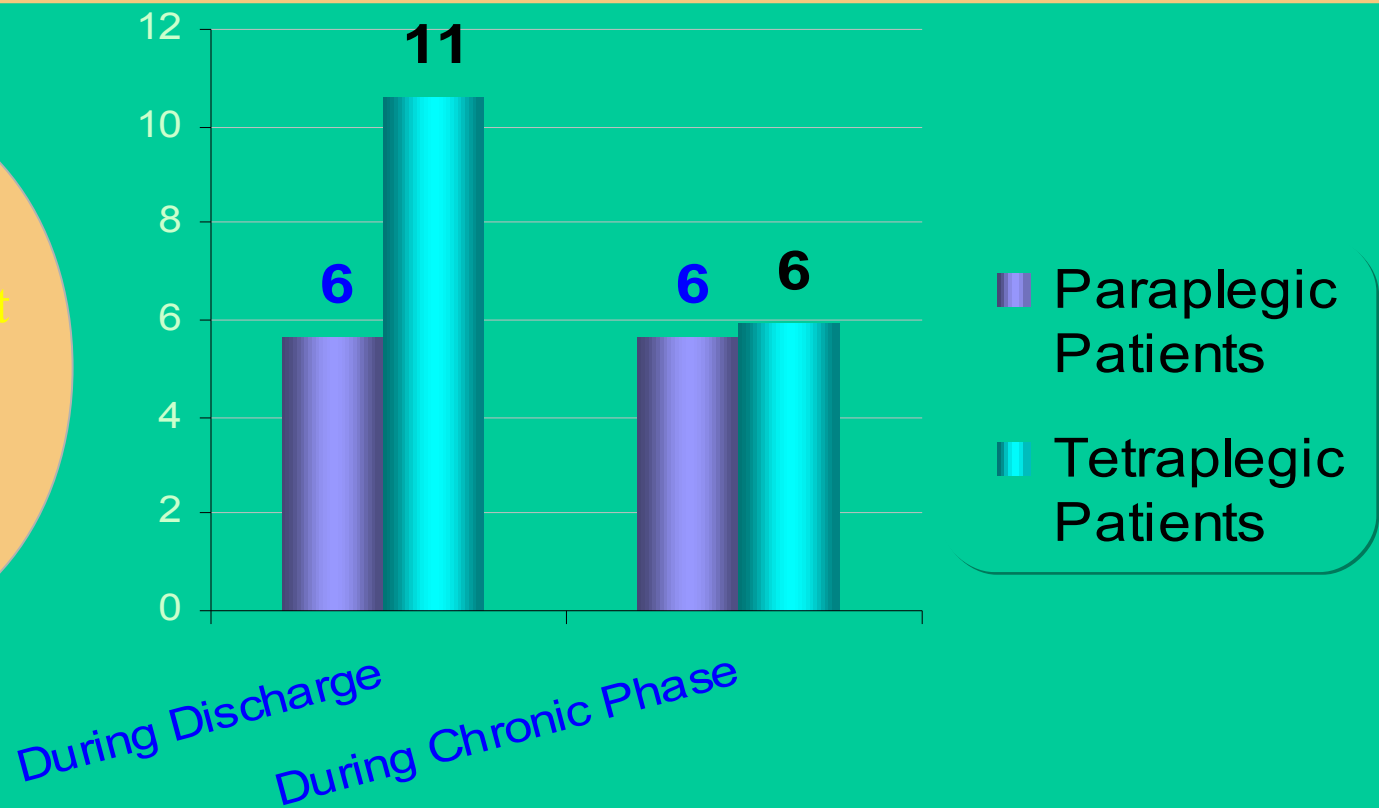
- ❖ Reserved for motivated patients with upper Motor Neuron Bladder with no detrusor sphincter dyssynergia or hyperreflexic detrusor and not wanting Clean Intermittent Catheterisation
- ❖ Medication advisable to reduce complication rate



suprapubic pressure

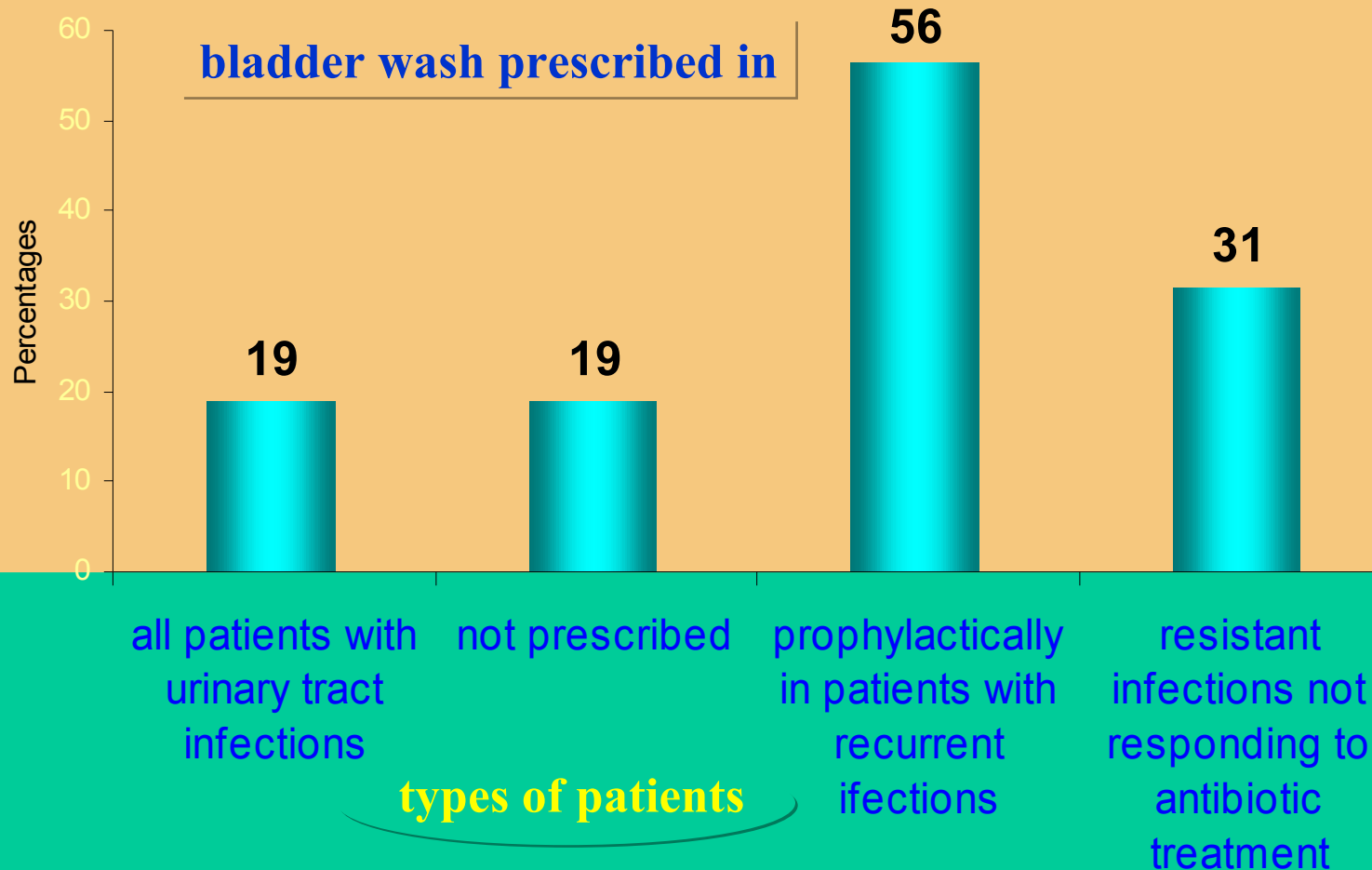
- ❖ Not advisable
- ❖ High pressure in bladder could lead to upper tract changes

bladder
management
by supra
pubic
pressure



practices to be discouraged in bladder management

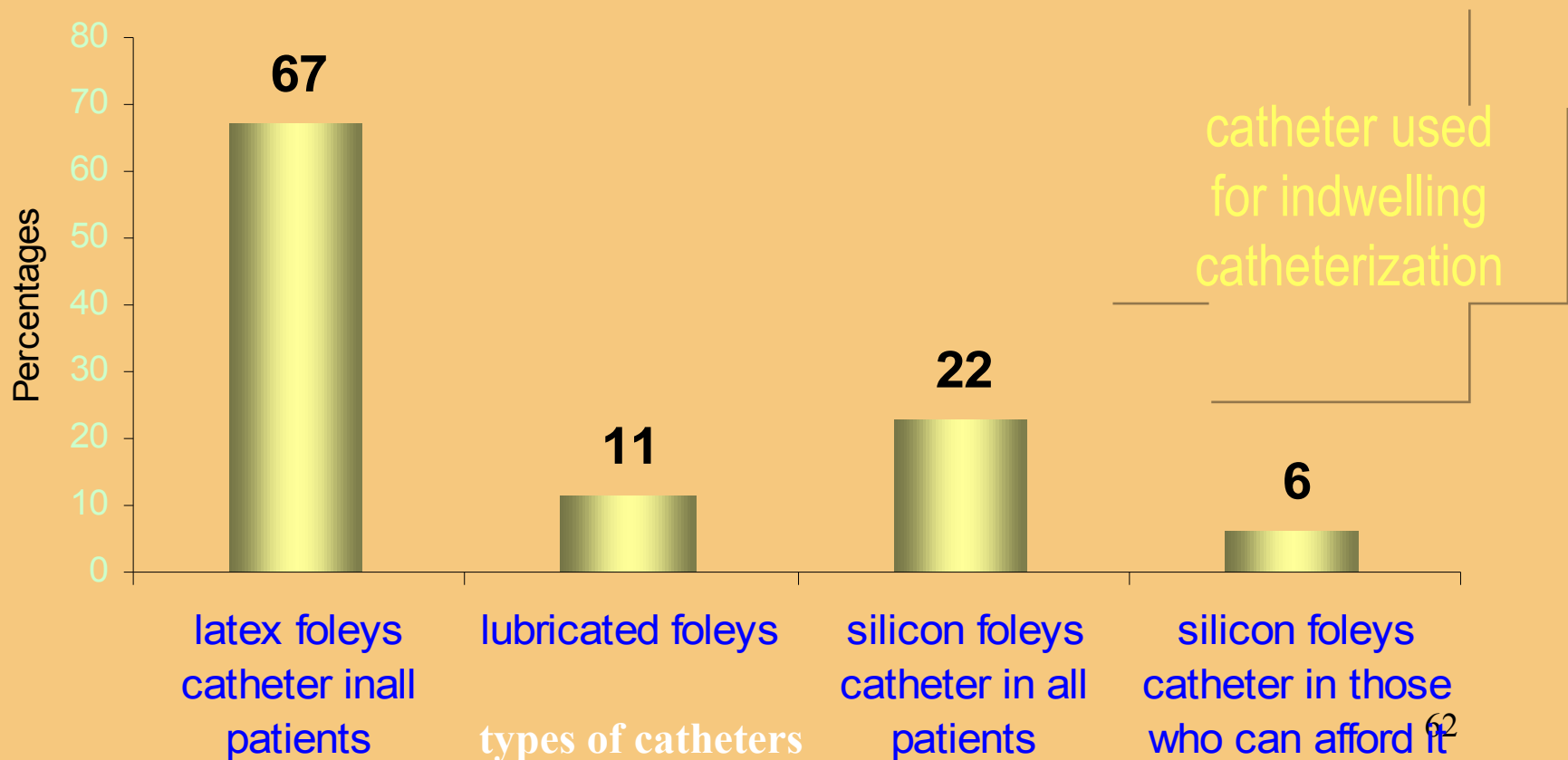
- ❖ Catheter clamping
- ❖ Regular Bladder wash (reserved for only an occasional case with non purulent discharge causing frequent catheter blockage)



types of catheter

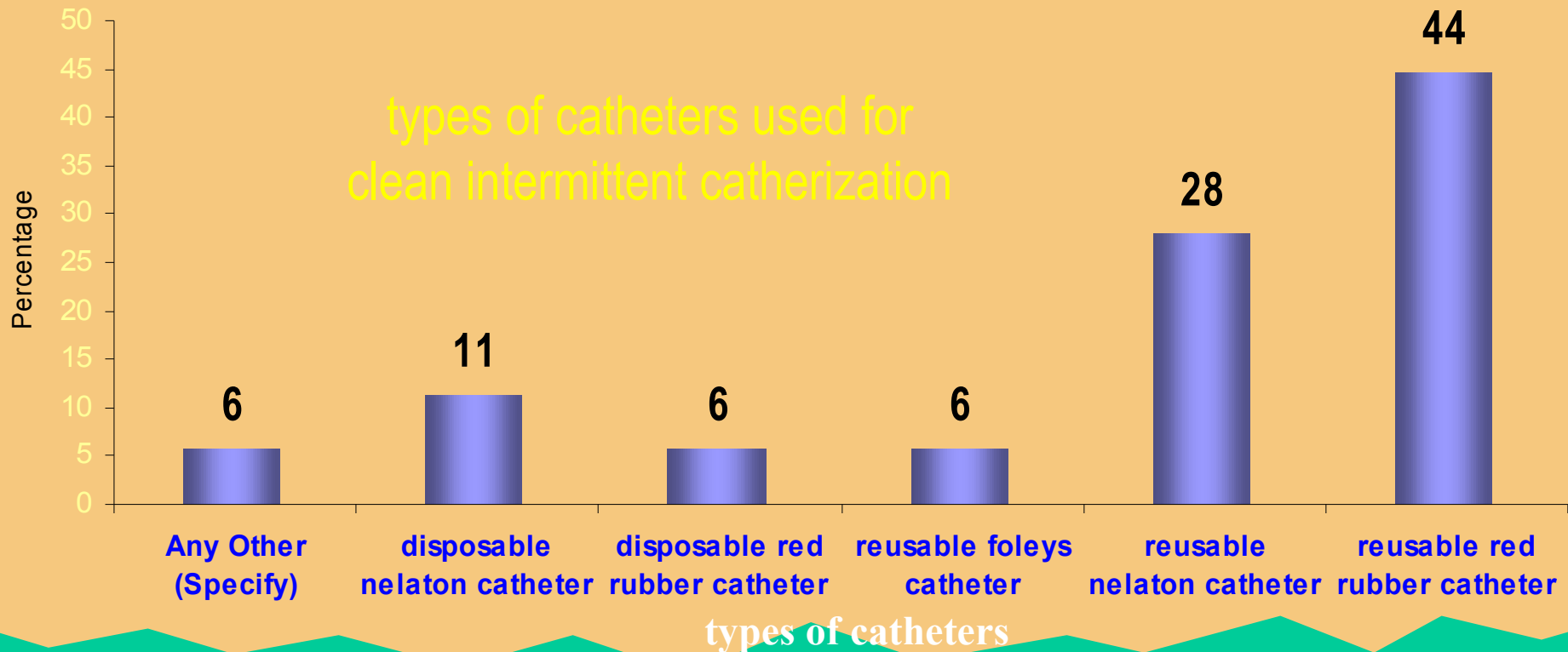


- For indwelling catheterisation
 - various forms of foleys catheter



types of catheter

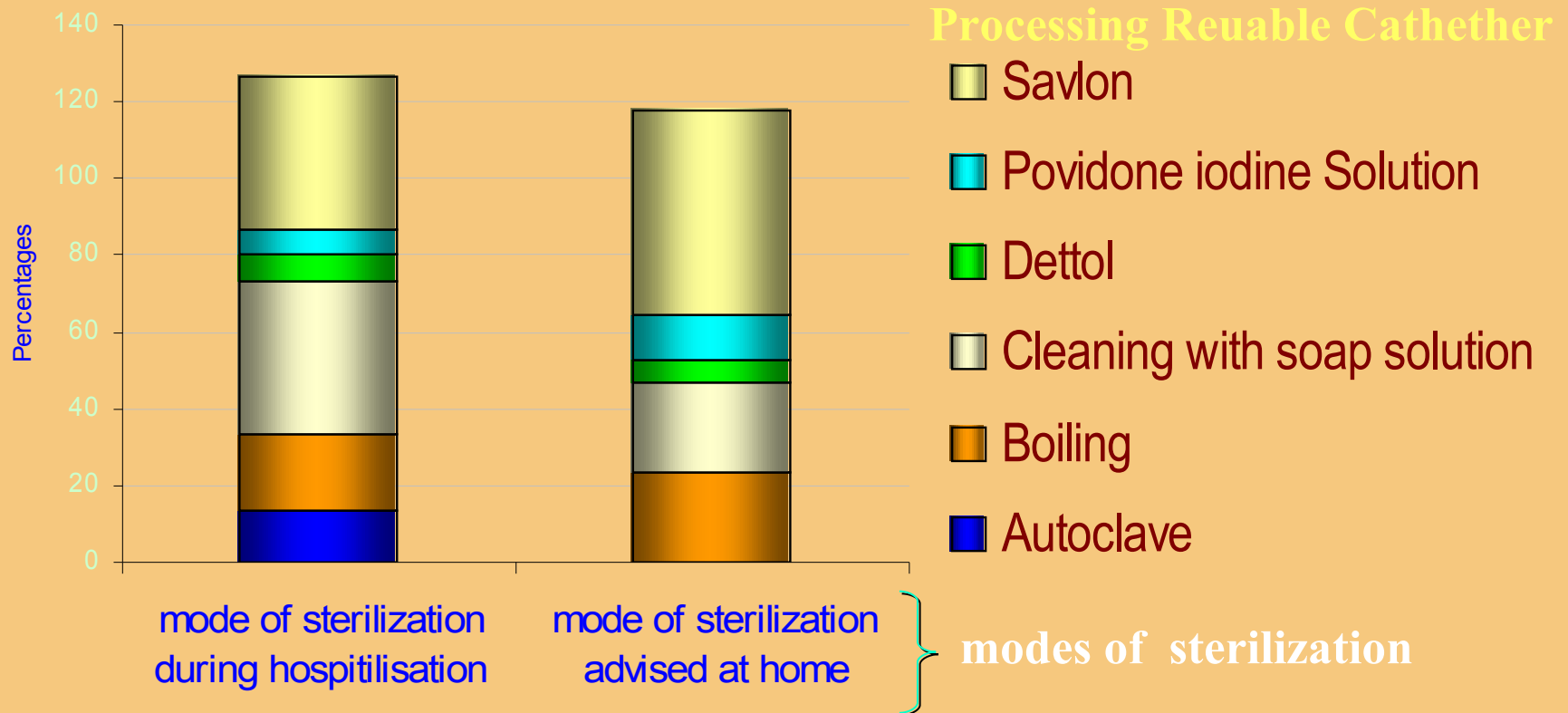
- ❖ For Clean Intermittent Catheterisation
 - Hydrophilic coated disposable catheter desirable
 - Nelaton Catheter, K-90, Red rubber catheter (no. 5-7),
 - Reusable foley's catheter practical



white paper on spinal injury management for opinion of the expert group

processing reusable catheter

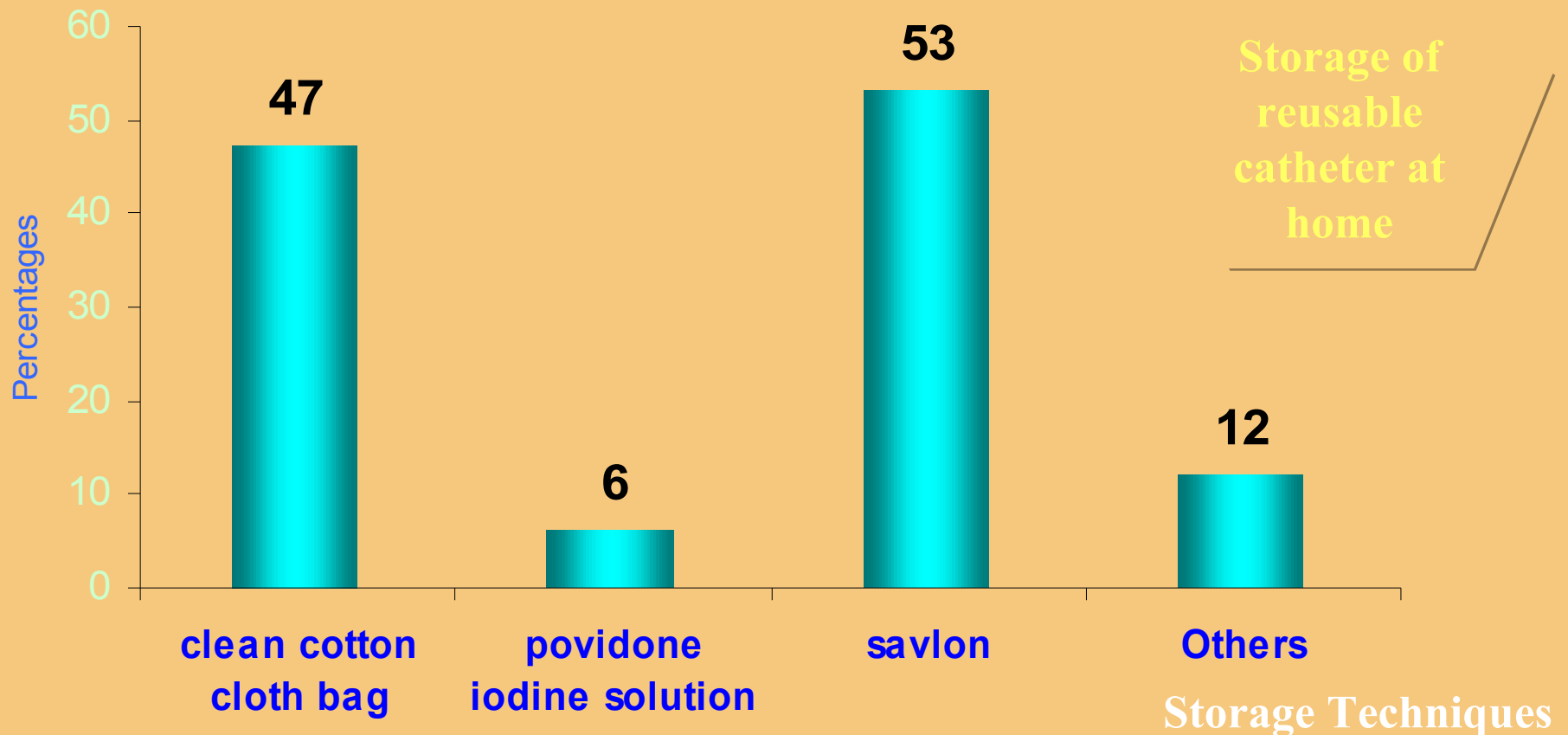
- ❖ Autoclaving while in hospital
- ❖ Cleaning with soap and running water at home
- ❖ Iodine, dettol, savlon etc to be condemned



white paper on spinal injury management for opinion of the expert group

storage of catheter

- ❖ Clean cotton cloth bag
- ❖ Dettol, savlon, iodine etc to be condemned

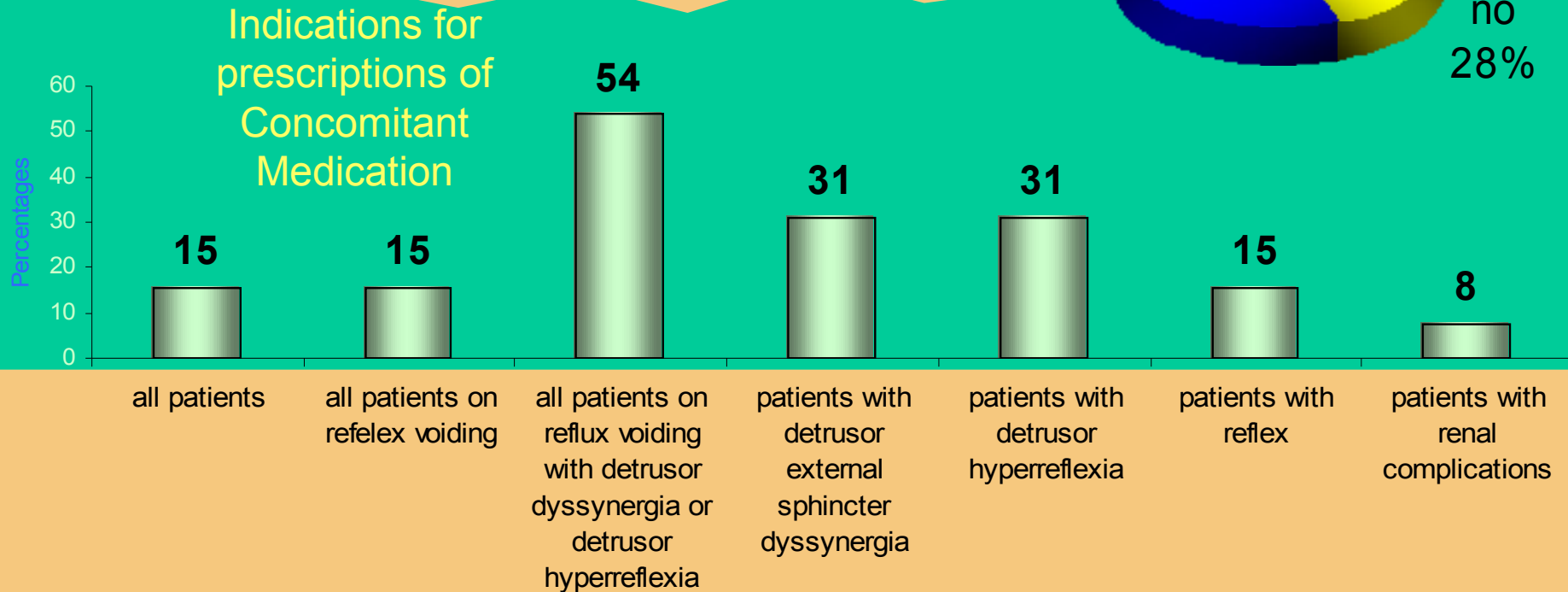
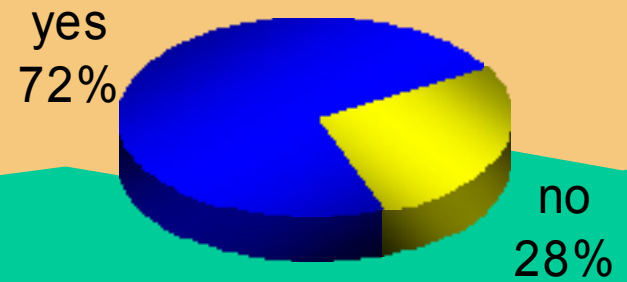


white paper on spinal injury management for opinion of the expert group

concomitant medication for bladder management

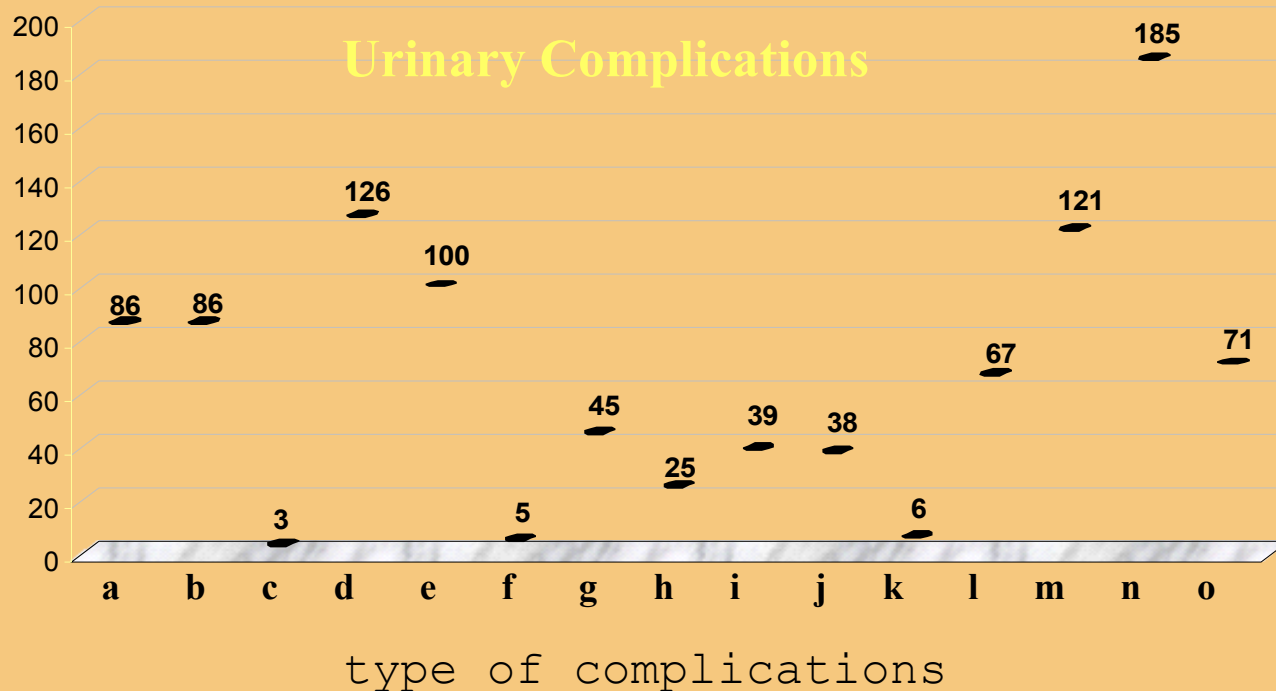
- ❖ Detrusor hyperreflexia
- ❖ Detrusor external dyssynergia
- ❖ Chronically contracted bladder
- ❖ All patients on reflex voiding

Concomitant medical therapy in patients with voiding dysfunction



complications of neurogenic bladder

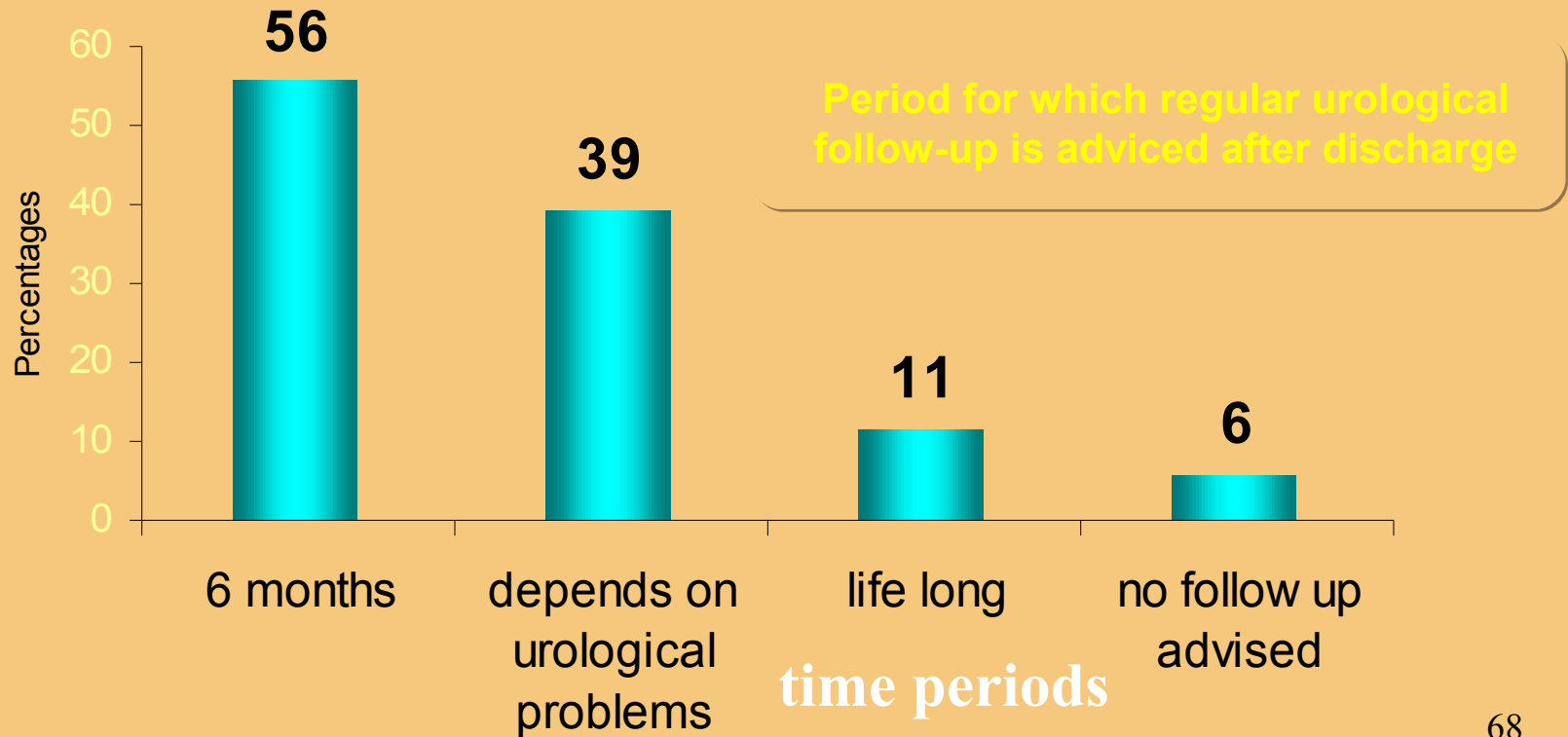
- ❖ Lower urinary tract complications like urinary tract infection, bladder calculi, orchitis / epididymitis, urethral fistulae / false passage
- ❖ Upper urinary tract complications like vesicoureteral reflux, hydronephrosis, pyelocaliectasis, renal calculi, renal and peri renal infection, renal insufficiency and failure.
- ❖ Contracted bladder



- a. autonomic hyperreflexia due to urinary tract problems
- b. bladder calculi
- c. bladder carcinoma
- d. bleeding per urethra
- e. contracted bladder
- f. end stage renal disease
- g. epididymitis
- h. hydronephrosis
- i. pyelonephritis
- j. renal calculi
- k. renal failure
- l. urethral rupture
- m. urethral stricture
- n. urinary tract infection
- o. vesico ureteric reflex

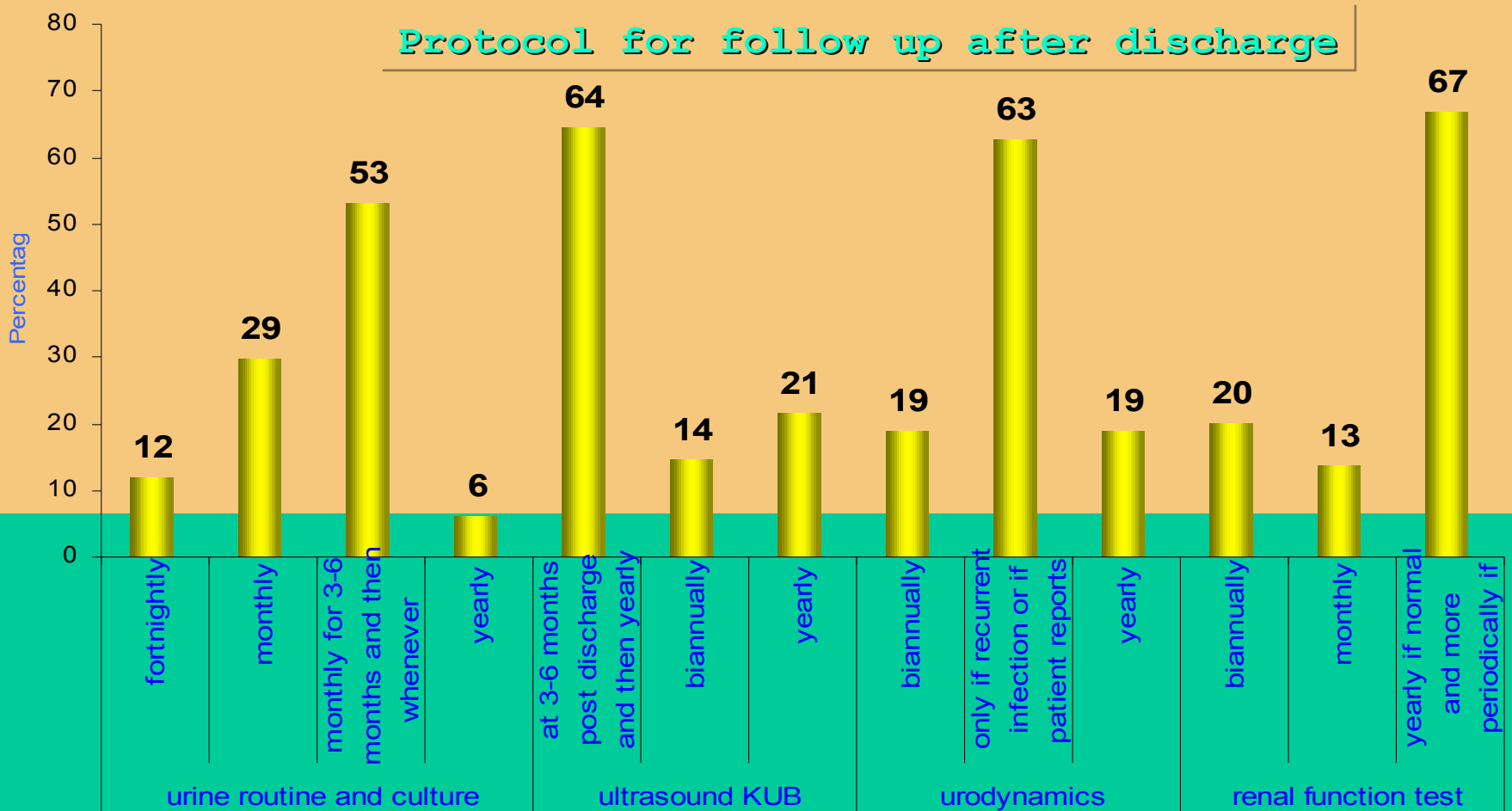
urological follow up

- ❖ Life long follow up required
- ❖ Urine routine and culture monthly and then on signs / symptoms
- ❖ Ultrasound KUB – yearly



urological follow up

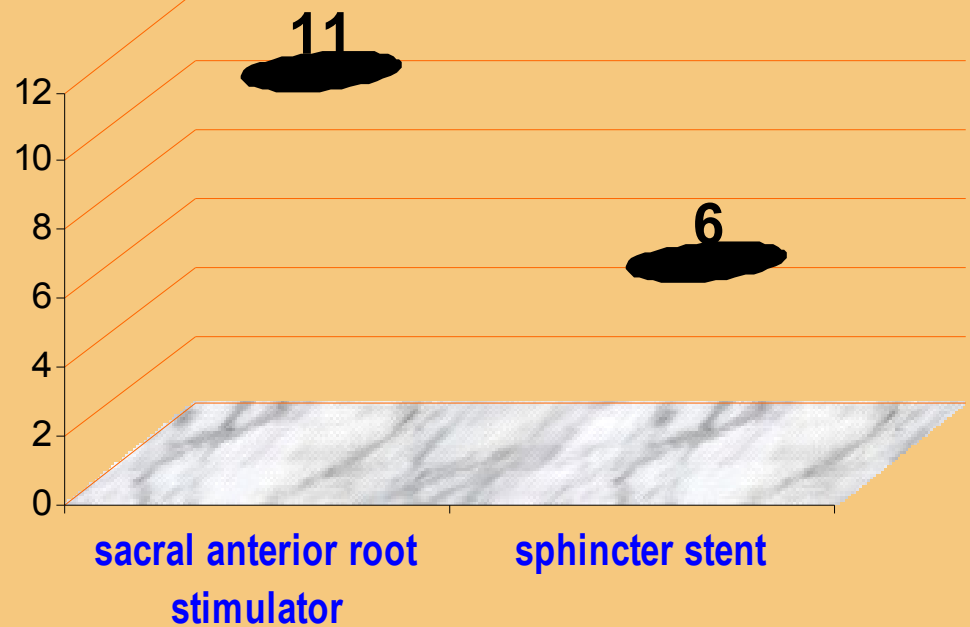
- ❖ Urodynamics only if repeated infections
- ❖ Renal Function test yearly or more frequently if deranged
- ❖ Yearly cystoscopy for patients on indwelling catheter



advanced surgical techniques in bladder management

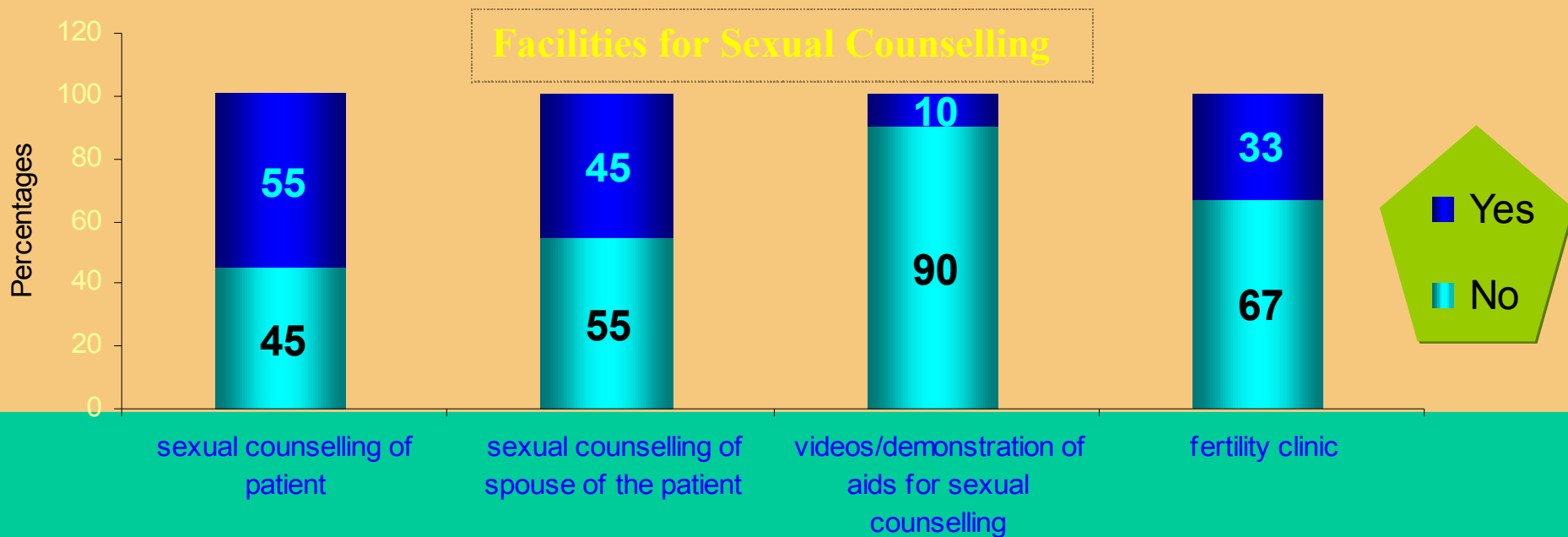
- ❖ Sacral anterior root stimulator
- ❖ Artificial bladder sphincter
- ❖ Bladder augmentation
- ❖ Sphincter stent

advanced surgical techniques for bladder management



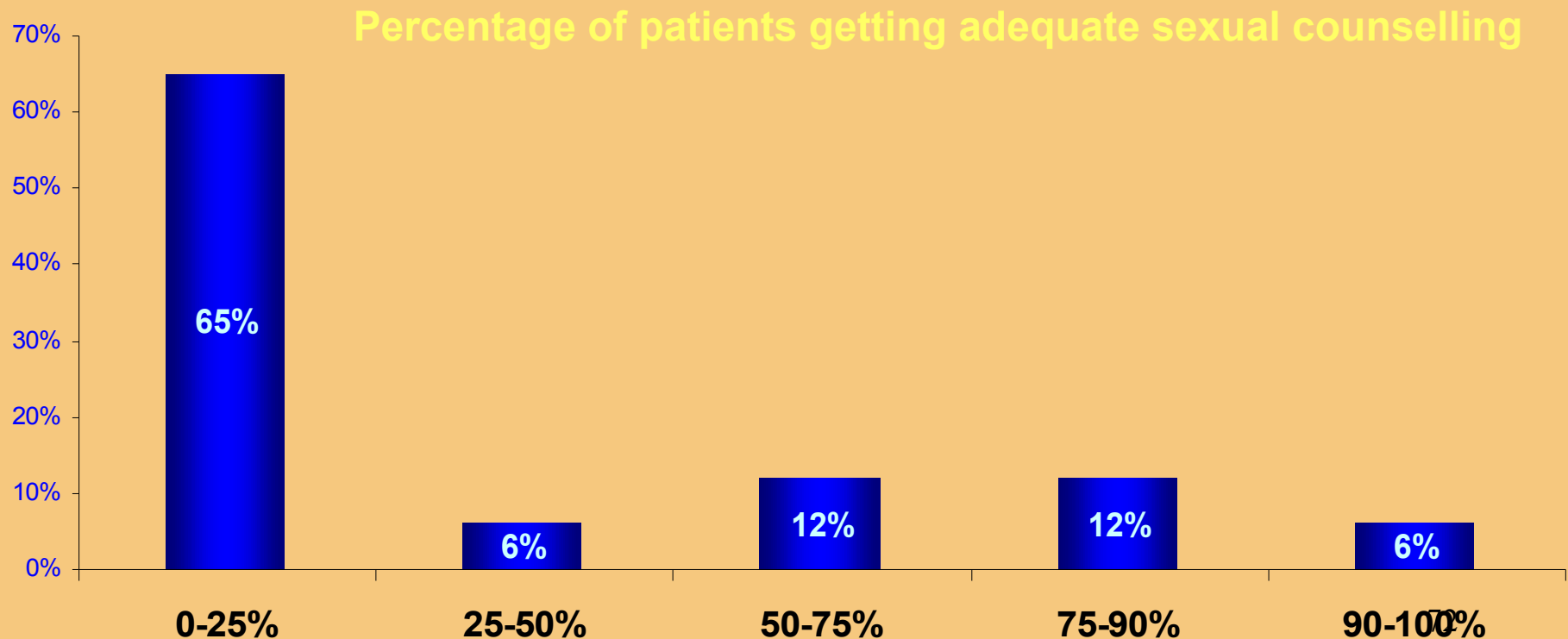
sexual rehabilitation

- ❖ Very important but neglected field
- ❖ Importance of non penetrative sex and emotional part of sex emphasized
- ❖ Oral Sildenafil highly effective for erection in majority of patients
- ❖ Vacuum constriction device, surface application of nitroglycerin, Intracavernous injections and Penile prosthesis are other methods for erection



sexual rehabilitation

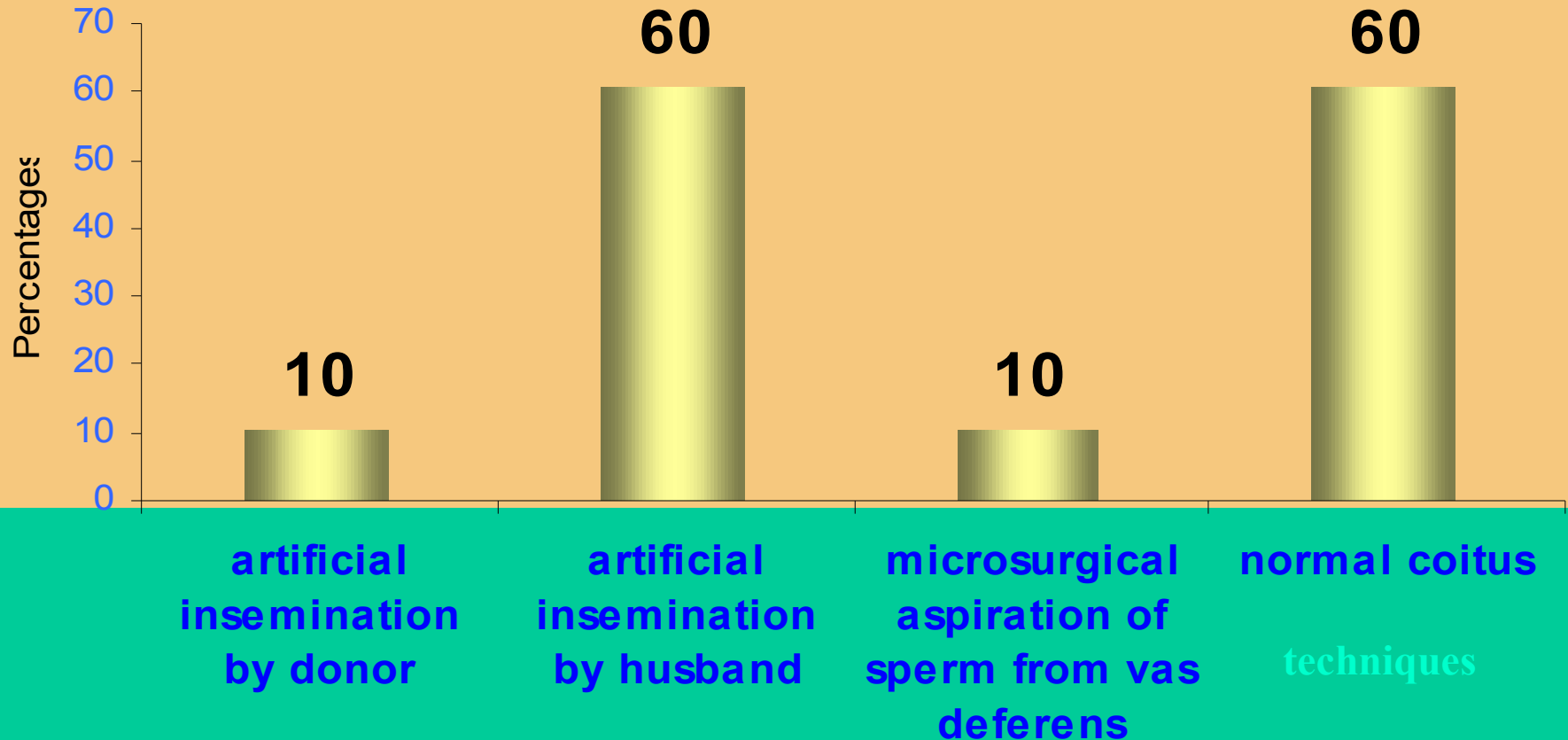
- ❖ In females lubricating jellies may be required
- ❖ Able partner could play the more active part
- ❖ Adequate time, trials and privacy to both partners
- ❖ Counselling of both partners



fertility

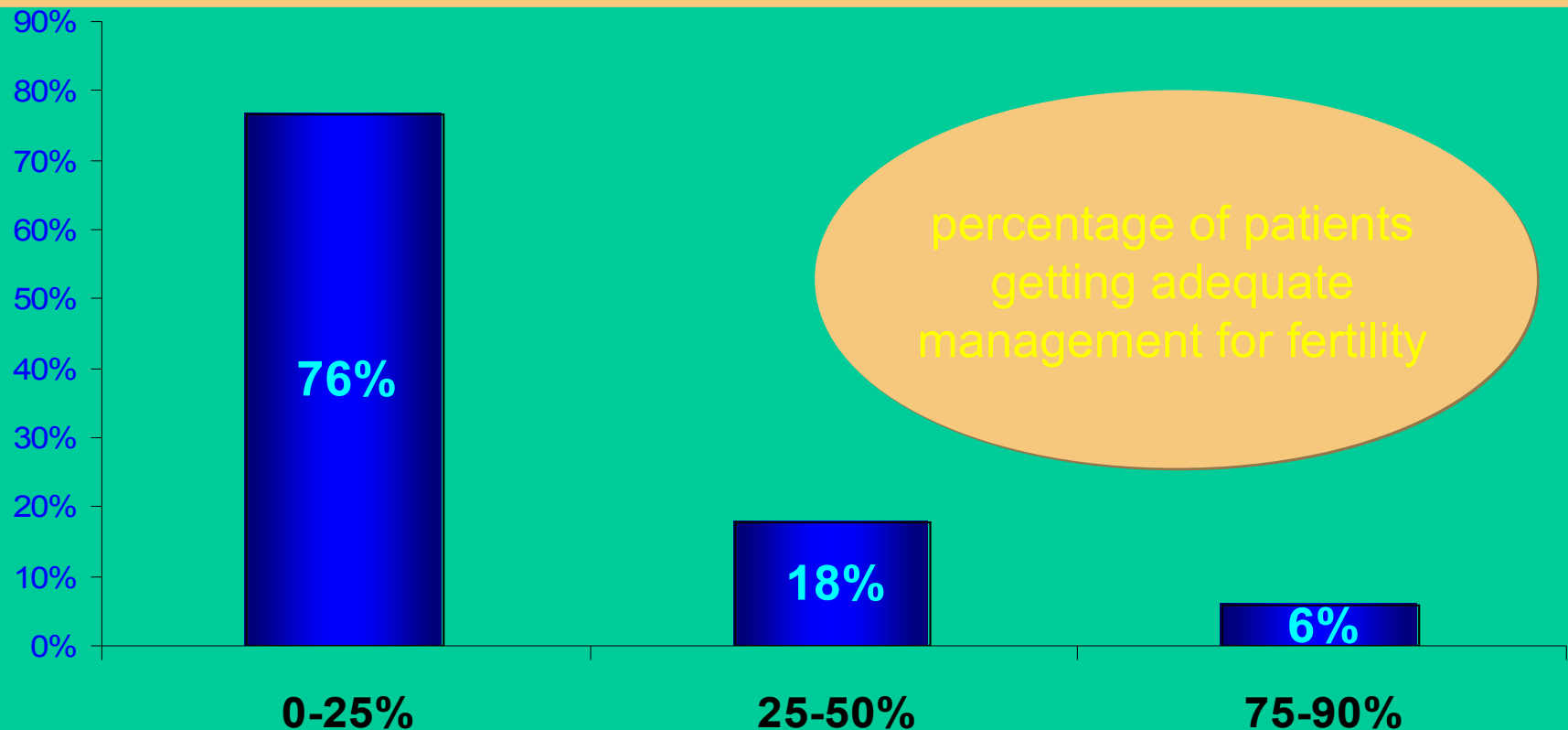
- ❖ Ejaculation (pro or retrograde) by vibrator or Electro ejaculation by trans rectal electrical stimulation.

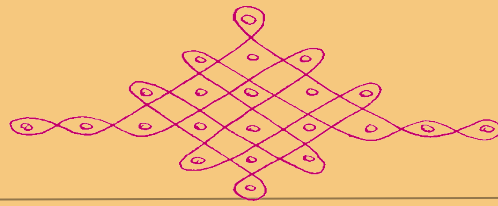
Techniques used for Fertility in spinal cord injured patients



fertility

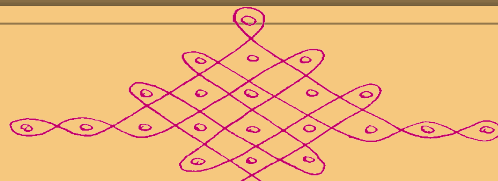
- ❖ Semen collected from urethra or bladder
- ❖ Artificial insemination, invitro fertilisation and embryo transfer
- ❖ Upto 50 – 60% success rates possible
- ❖ Caesarean delivery more common





Common Systemic Complication in SCI

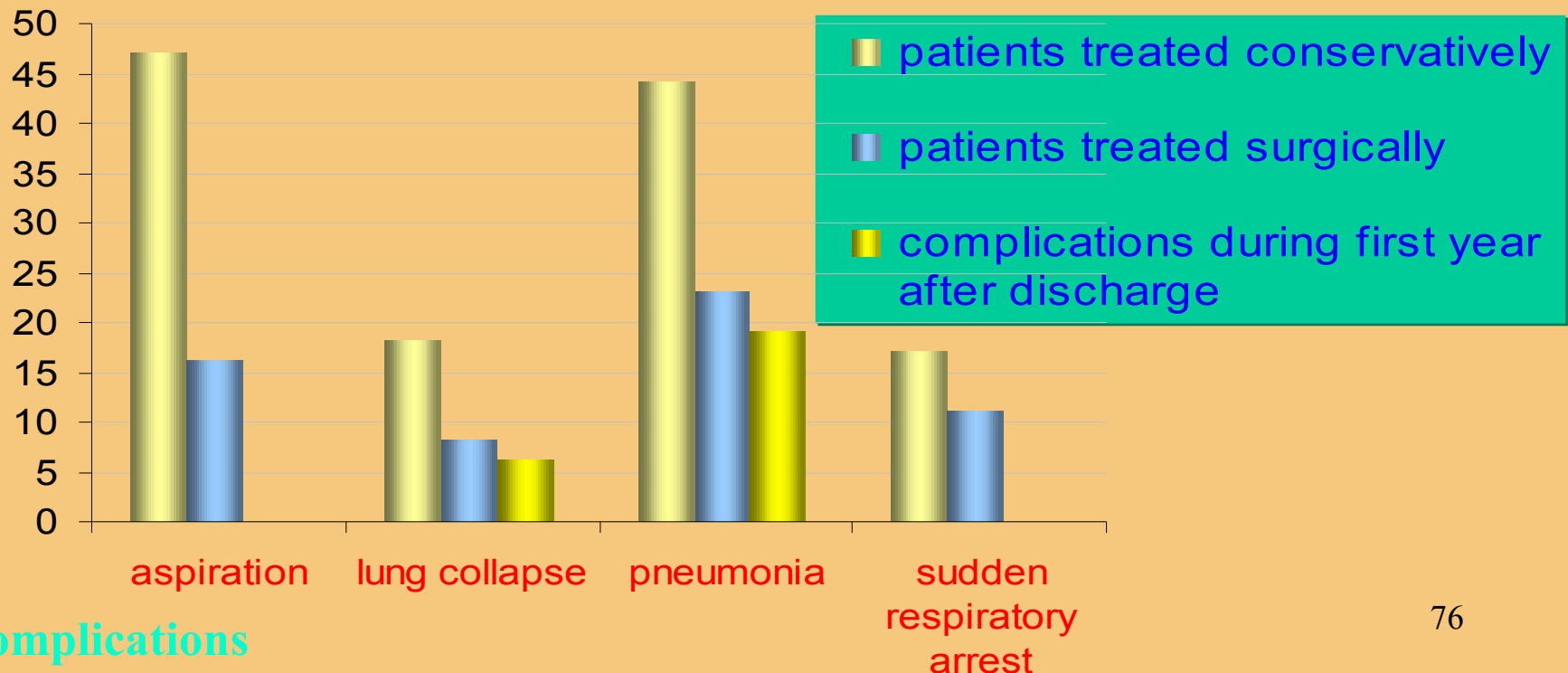
Prevention & Management



respiratory complications

- ❖ Pulmonary complications most common cause of death during both the acute and chronic phases
- ❖ Aspiration, atelectasis, pneumonia and Ventilatory failure
- ❖ Significant correlation with age, complete injury
- ❖ Prevention by proper respiratory management

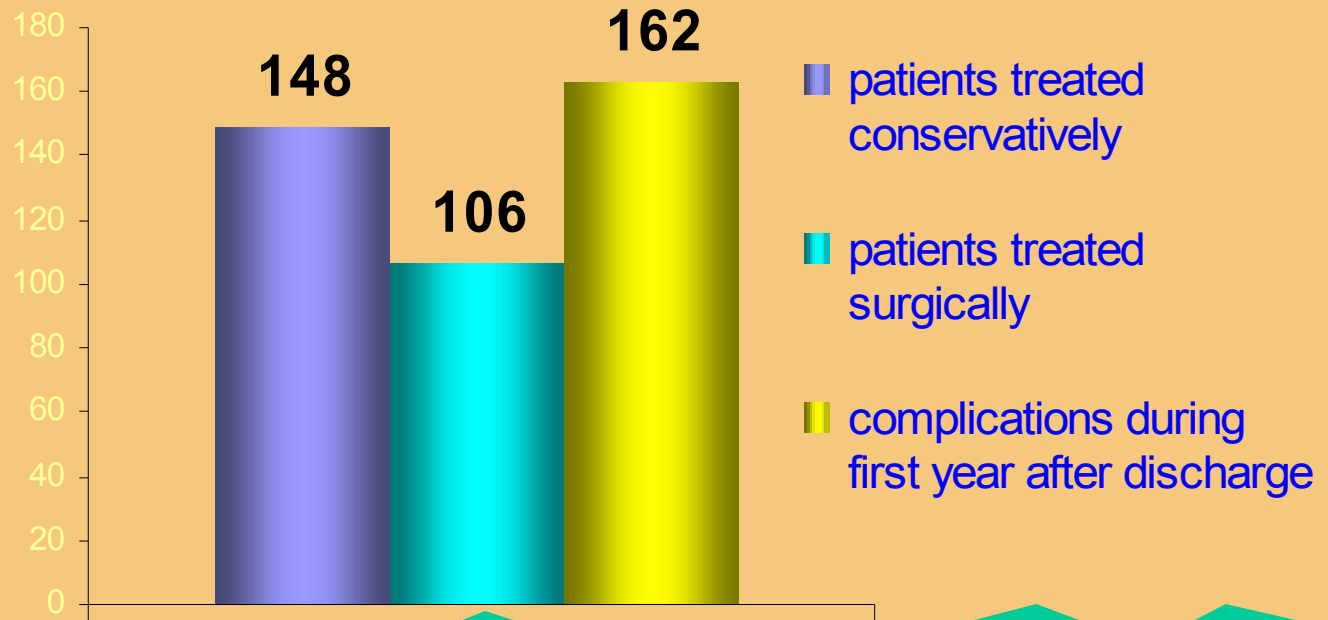
Complications in Spinal Cord Injury



pressure ulcers

- ❖ Shear in combination with pressure is major etiologic factor
- ❖ Other factors include skin maceration due to moisture, poor nutrition
- ❖ Commonly over bony prominences
- ❖ Most common sites – sacrum, heels, ischium
- ❖ Prevention by regular turning, skin care, avoiding shear, pressure and other etiologic factors, special beds and mattress and patient education

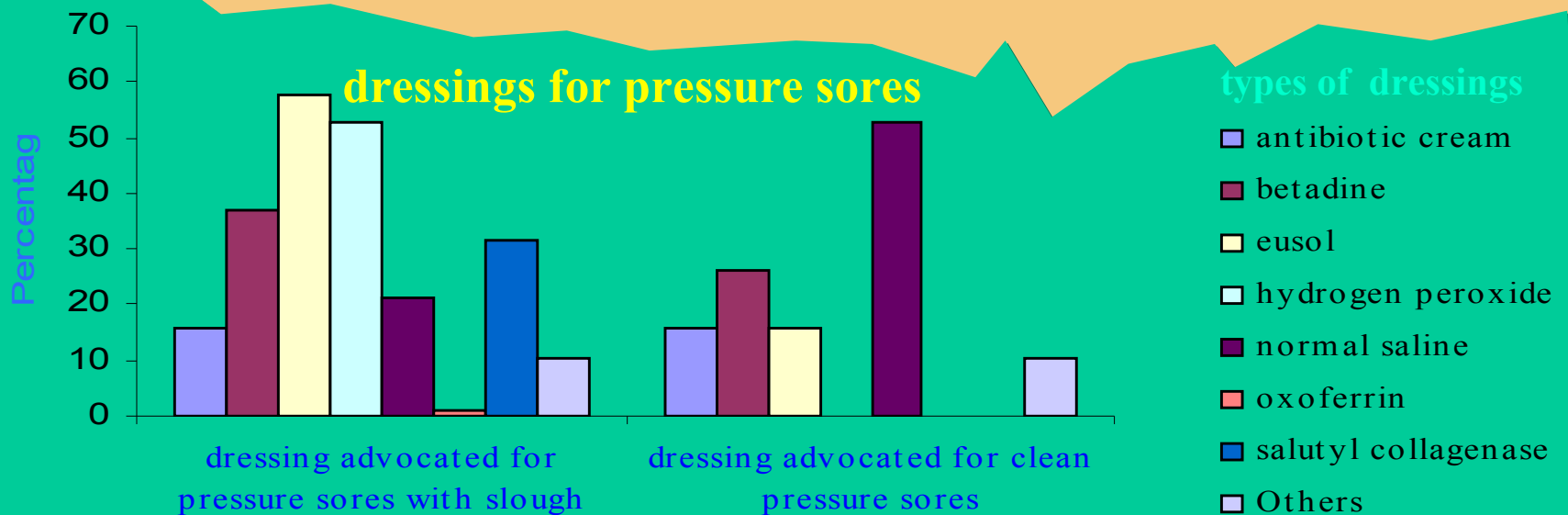
Pressure Ulcers



pressure sore

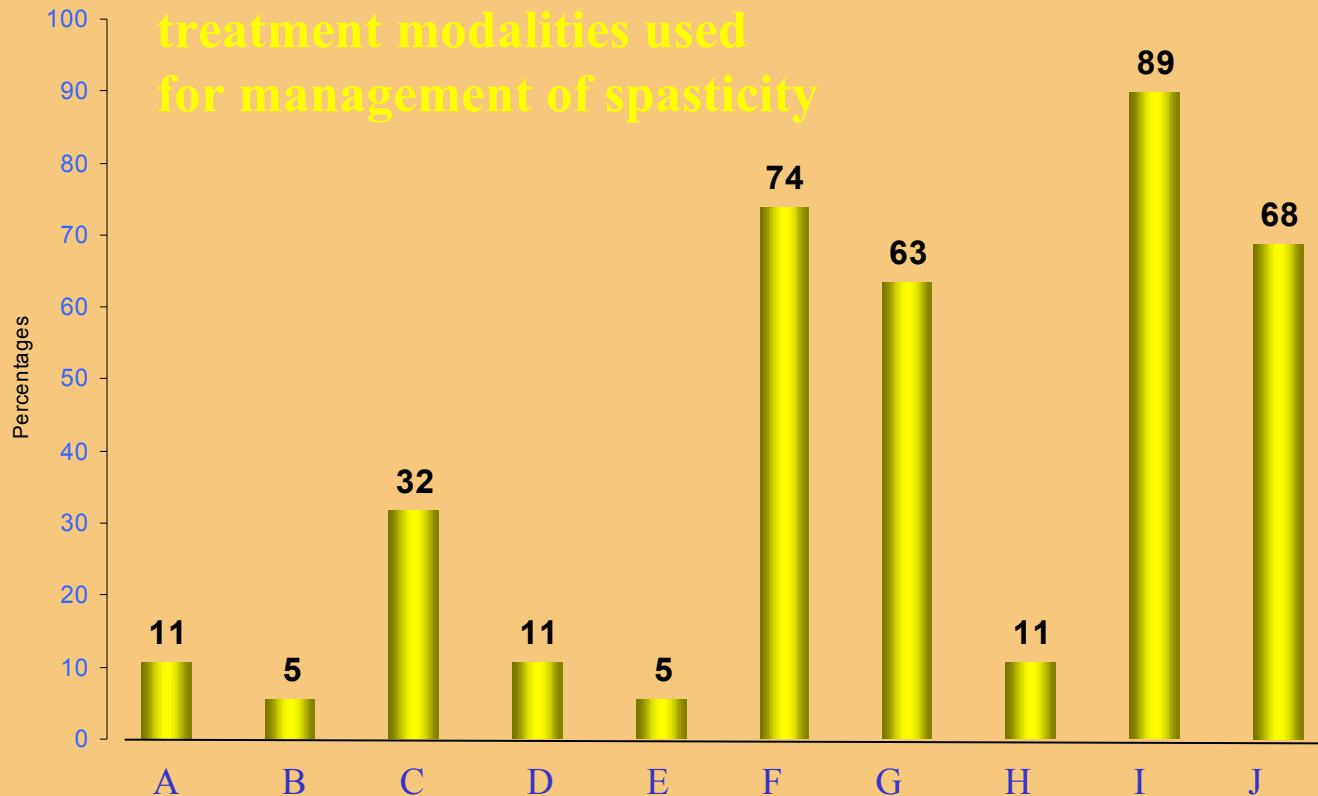
management of pressure ulcers

- ❖ Removing pressure – lying prone or turning side to side
- ❖ Adequate nutrition
- ❖ Debridement
- ❖ Wet to dry dressings to remove residual necrotic tissues
- ❖ Occlusive dressings once wound clean
- ❖ Flap surgery for grade III and IV sores



spasticity

- ❖ Excess spasticity interferes with activities of daily living
- ❖ May cause pain and interfere with sleep
- ❖ Prevention by regular physiotherapy



- A. alcohol/phenol block
- B. Any Other (Specify)
- C. botox injection
- D. intrathecal baclofen pump
- E. neurosurgical procedures like myefotomy, rhizotomy
- F. oral baclofen
- G. oral tizanide
- H. orthopaedic procedures
- I. regular physiotherapy & mobilization
- J. removal of irritating foci beneath level of injury like ingrowing toenail, bed sore, constipation, UTI etc

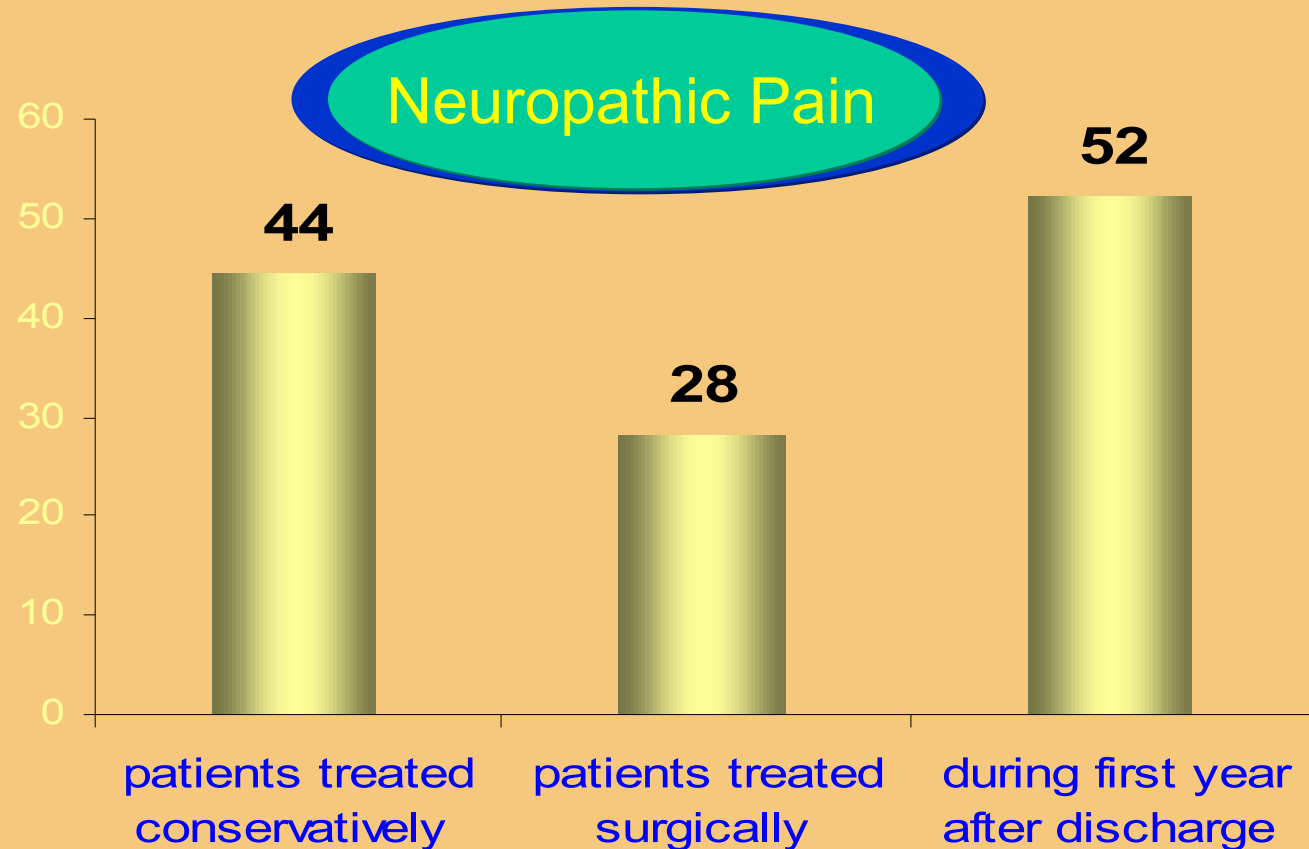
spasticity

□ Management

- Removal of irritating stimuli below level of injury
- Regular physiotherapy
- Oral baclofen or other drugs
- Local nerve blocks
- Destructive or ablative surgical procedures such as rhizotomy or myelotomy
- Intrathecal Baclofen pump if oral drug causes drowsiness or is not effective and Intrathecal baclofen trial shows good results

neuropathic pain

- ❖ Single most important factor responsible for lowered ratings of quality of life, when it occurs
- ❖ Drugs like Gabapentine, Amitryptiline, anti-inflammatories
- ❖ Peripheral nerve blocks
- ❖ Partial or complete surgical ablation or destruction of spinal cord or nerve root tissues – myelotomy, cordotomy, surgical or percutaneous posterior rhizotomy and dorsal root entry zone procedures

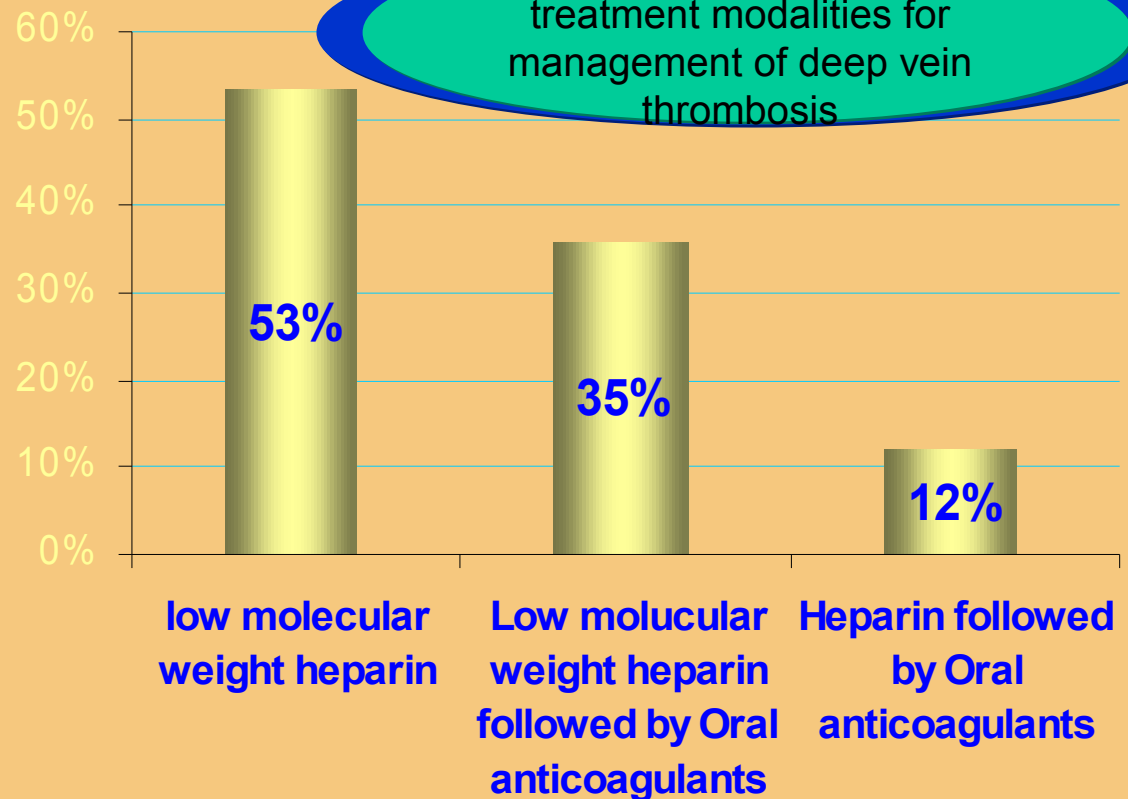


advanced surgical procedures in spasticity & pain management

- ❖ Baclofen pump implantation
- ❖ Dorsal Column Stimulator

deep vein thrombosis

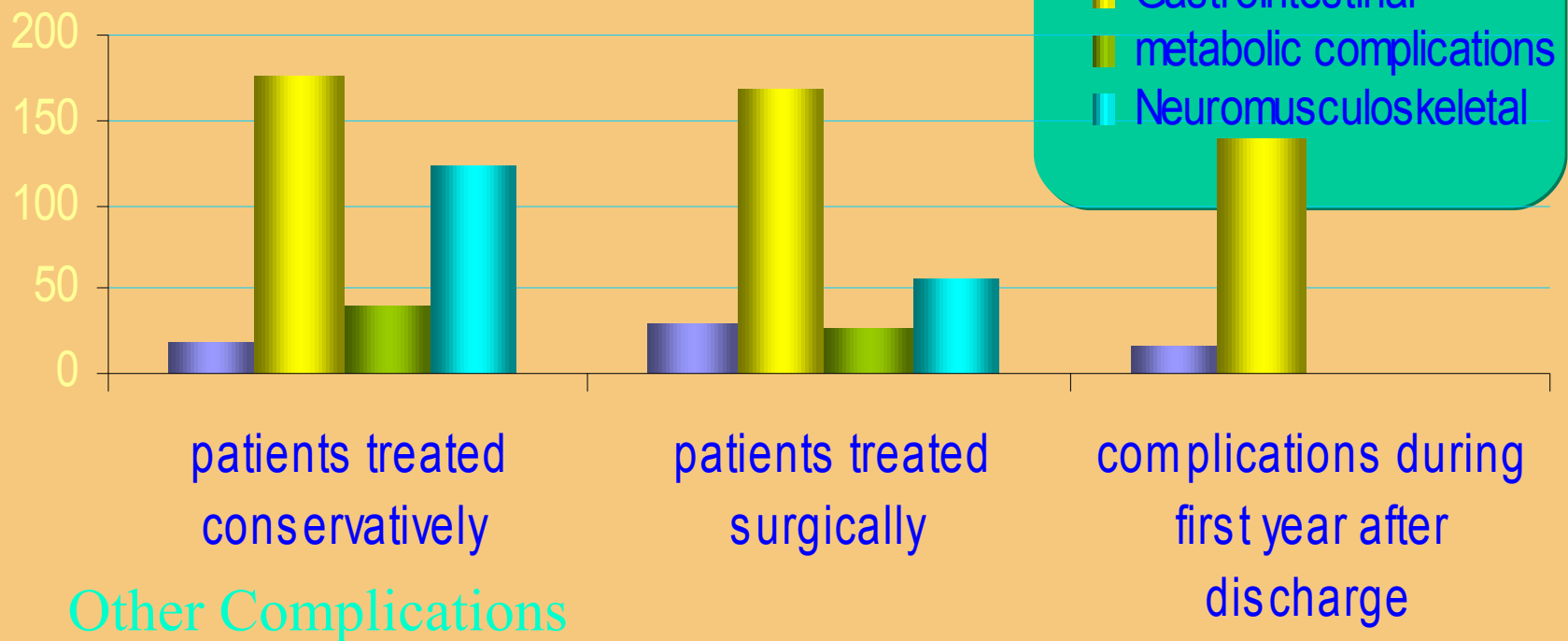
- ❖ Detection by clinical inspection or by specific tests such as Doppler Ultrasound
- ❖ Intravenous heparin adjusted daily according to APTT
- ❖ Low molecular weight heparin(1.5-2mg/kg body weight) doesn't require monitoring



- ❖ Sodium warfarin started within few days in dose of 2-5 mg/day and increased gradually depending on prothrombin time/INR; heparin discontinued in 7-10 days when Prothrombin Time has reached a level 1.5 or 2.0 times the control value
- ❖ Anticoagulants for DVT without Pulmonary Embolism continued for 3 months; for 6 months in PE with DVT

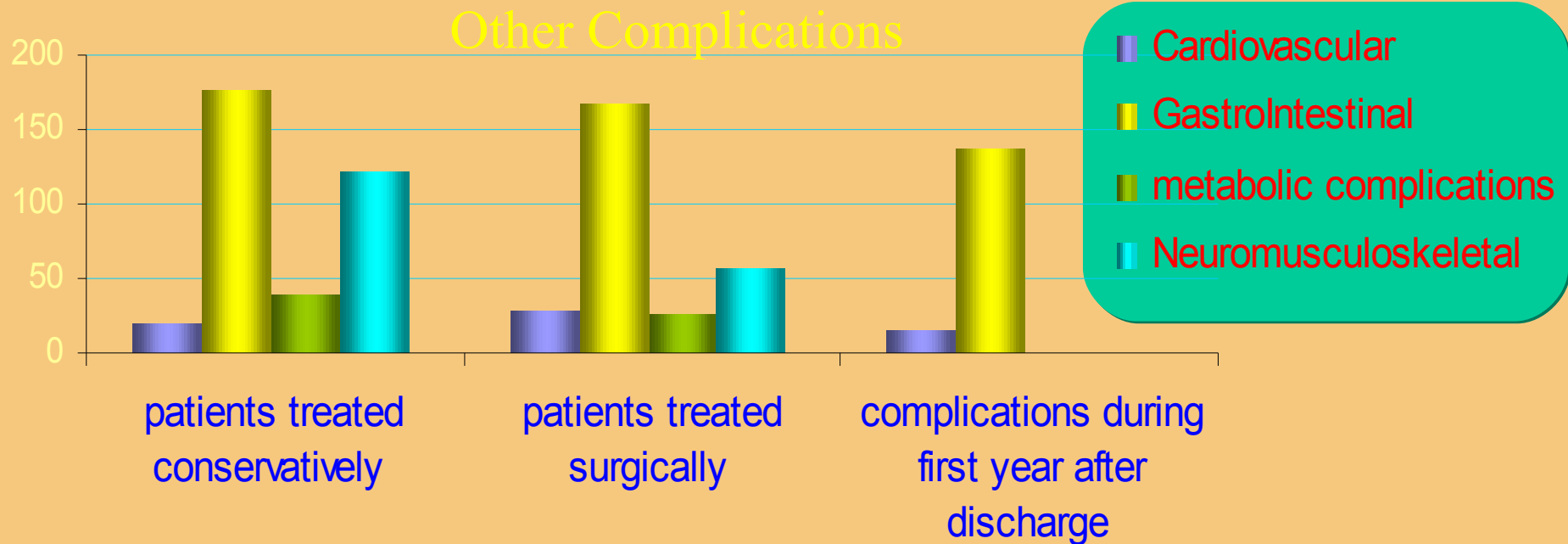
other complications

- ❖ **Cardiovascular complications** like Autonomic Dysreflexia, Pulmonary Embolism Myocardial Infarction and Cardiopulmonary arrest
- ❖ **Neuromusculoskeletal Complications** like - Heterotopic ossification, osteoporosis, contractures, Musculoskeletal pain, post traumatic syringomyelia



Other Complications

other complications

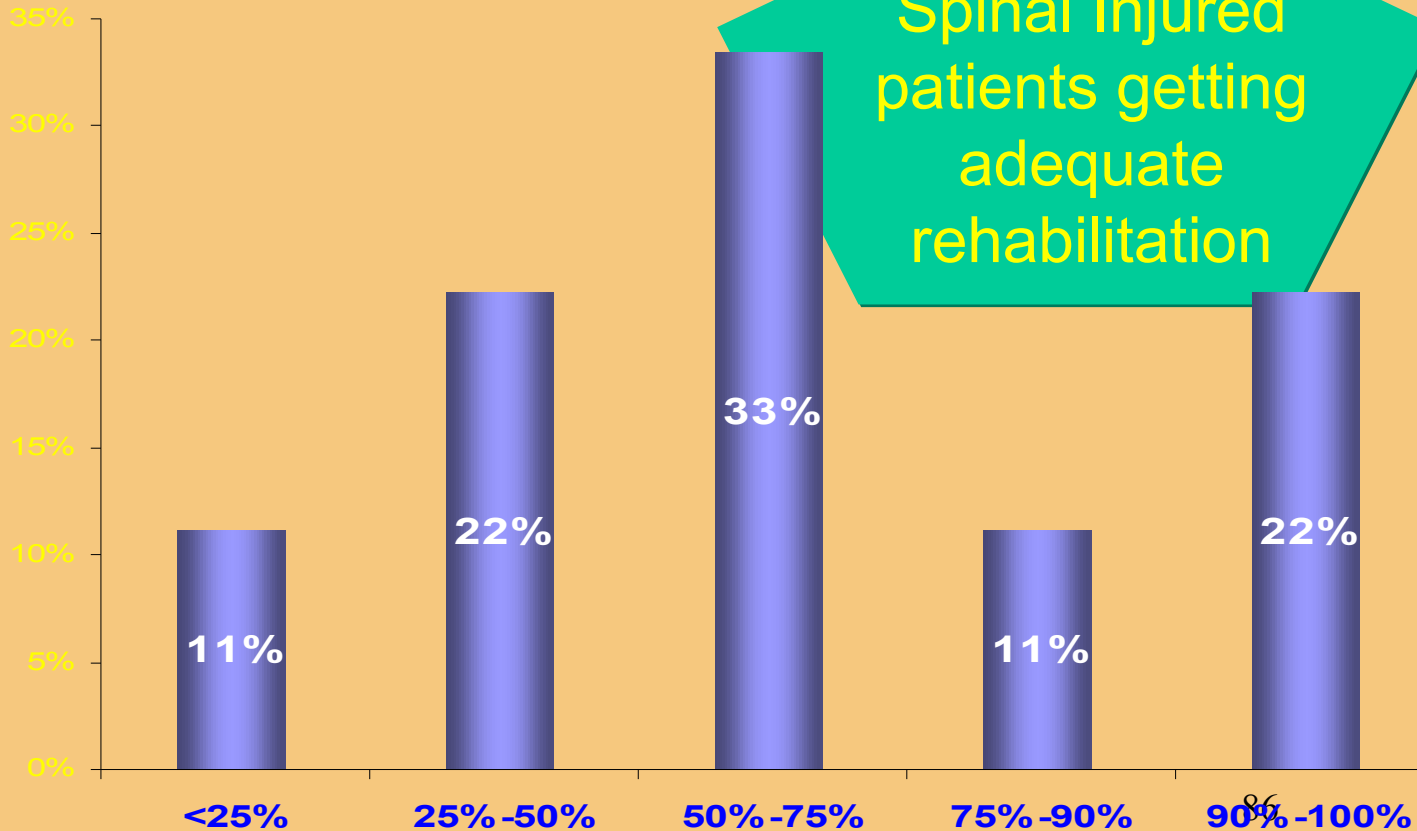


- ❖ **Gastrointestinal Complications** like – Gastrointestinal hemorrhage, paralytic ileus, Late GI complications like gall stone disease, constipation, hemorrhoids, abdominal distension constipation,
- ❖ **Metabolic complications** like immobilization hypercalcaemia, hypoproteinemia etc.

rehabilitation for spinal cord injured

- ❖ Major goal of rehabilitation is to reduce disability by increasing the independence with which individuals perform activities of daily living.
- ❖ Should be done according to the environment in which the patient has to return
- ❖ Starts on day one
- ❖ Requires specially trained staff and team effort

- ❖ Goals planned at initial assessment in consultation with patient and family members
- ❖ Achievement of Goals monitored by the team



rehabilitation for spinal cord injured

- Functional Independence Measure is the most widely used disability measure within rehabilitation. There are two independent measures within the FIM
 - ❖ A motor dimension including self care, sphincter control, mobility and locomotion
 - ❖ A cognitive dimension including communication and social cognition

management of tetraplegic hand

- ❖ Splints and asistive devices
- ❖ Tendon transfer surgery
- ❖ Functional Electrical stimulation

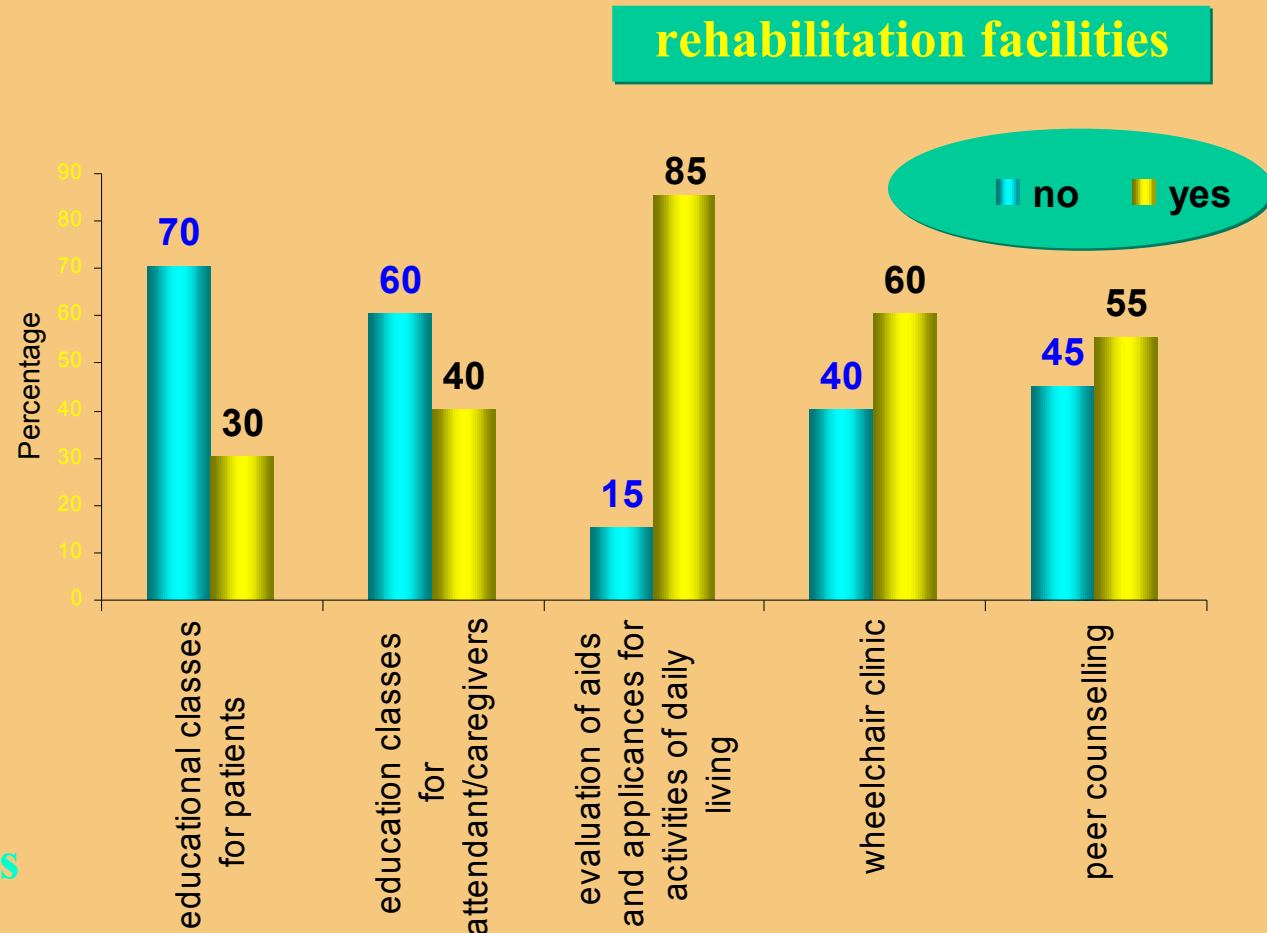
splints used for management of tetraplegic hand



rehabilitation

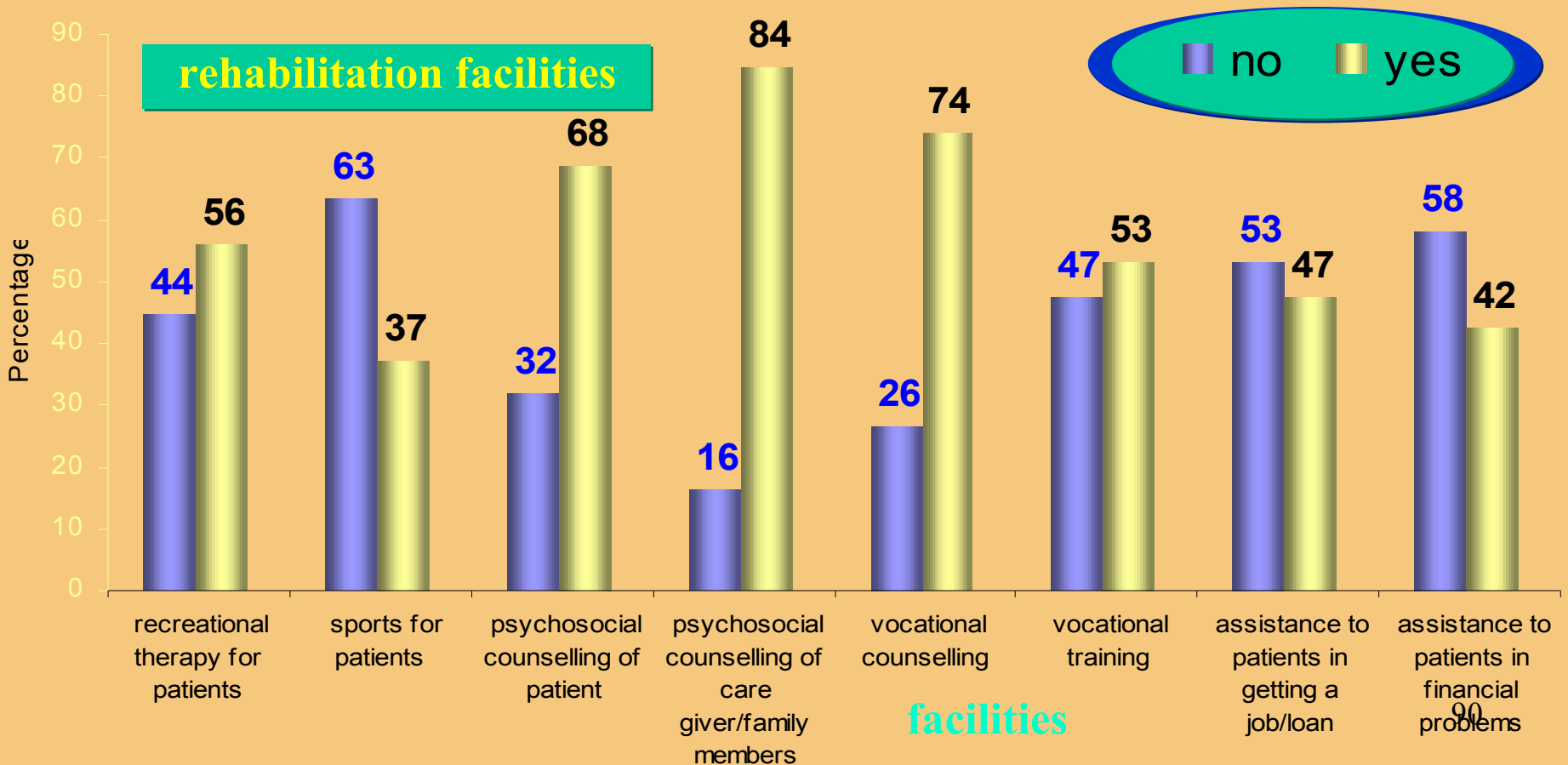
- ❖ Wheelchair clinic
- ❖ Asistive Technology
- ❖ Educational classes for patient/care give
- ❖ Sexual Counselling
- ❖ Fertility Clinic
- ❖ Peer Counselling

facilities



rehabilitation

- ❖ Psychosocial counselling of patient / care giver
- ❖ Vocational counselling and training
- ❖ Social assistance like getting loans, financial assistance
- ❖ Sports and recreational therapy



rehabilitation

- ❖ Pre-discharge home visit
- ❖ Follow-up home care services
- ❖ Rehabilitation into community
- ❖ Regular follow-up

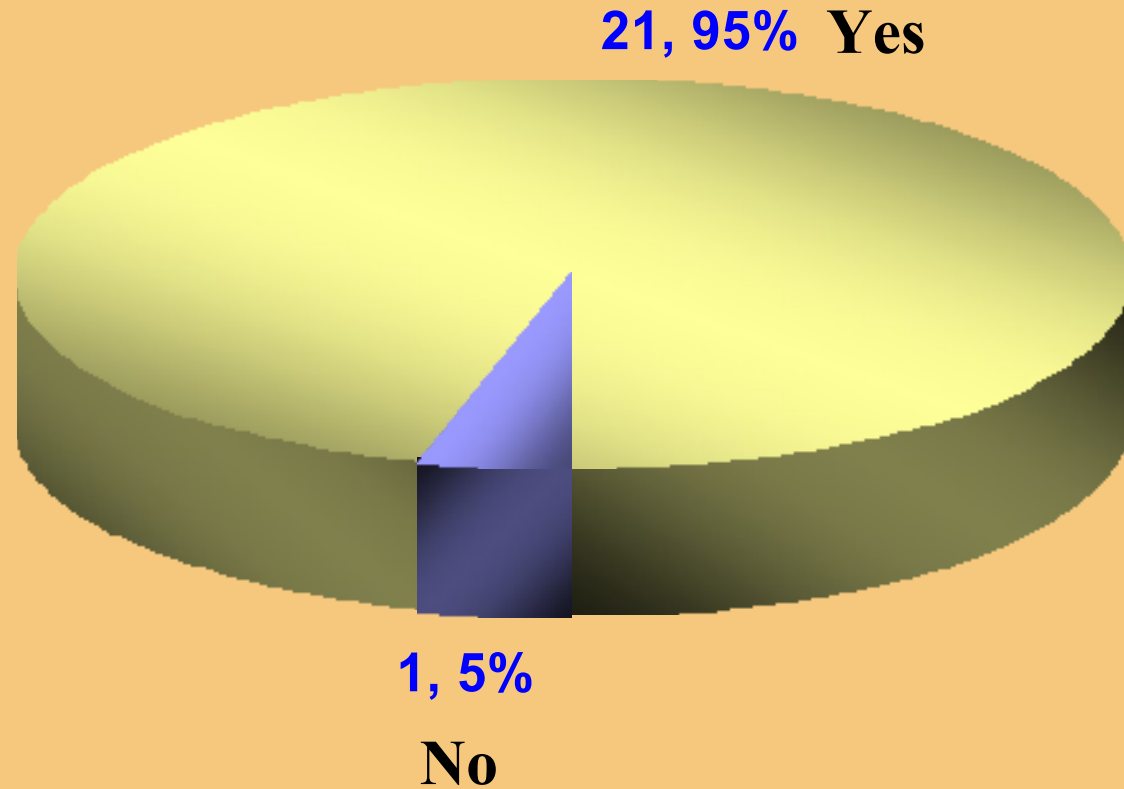


causes of death

- ❖ Pneumonia, Nonischaemic heart disease and septicemia are the leading, second leading and third leading causes of death respectively in developed countries
- ❖ Dramatic reduction in mortality due to diseases of urinary tract

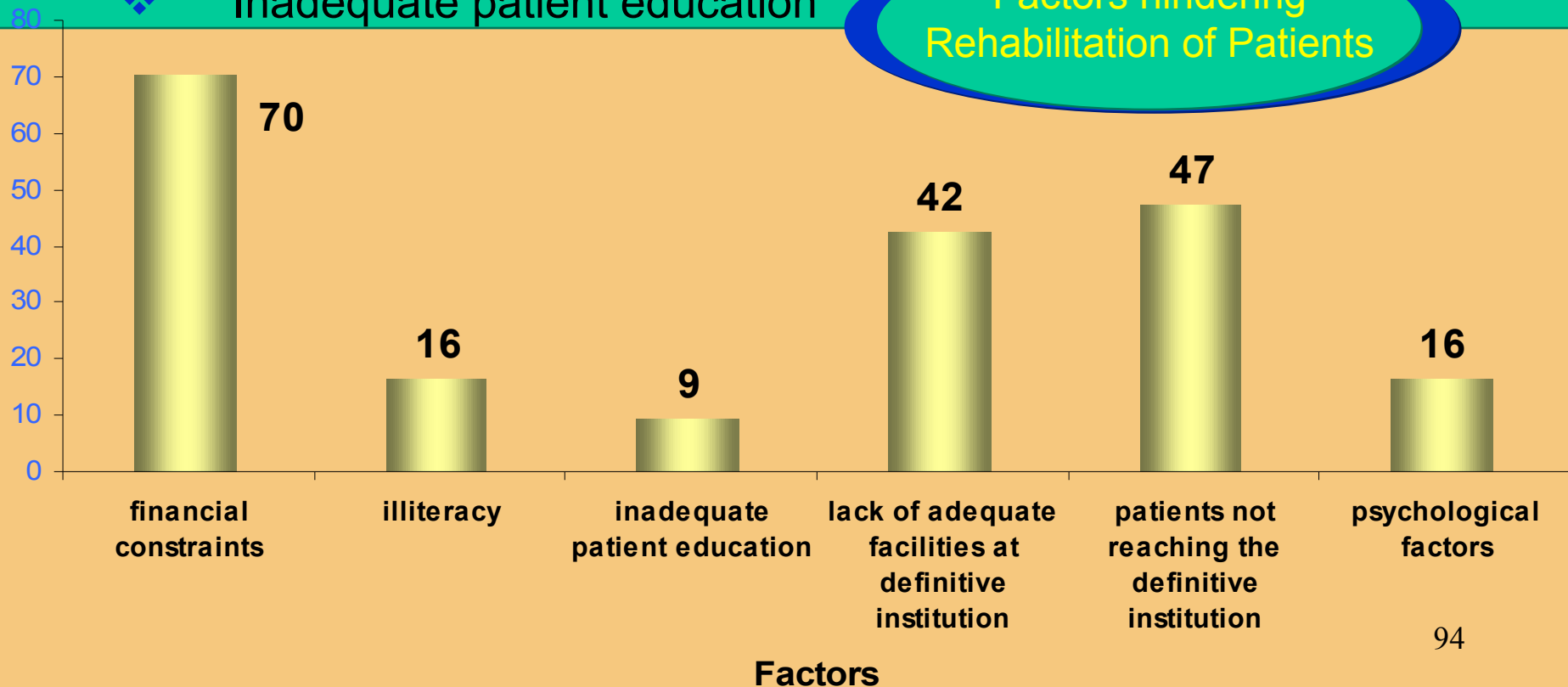
SCI – prevention

- ❖ “Prevention is better than cure” particularly relevant in SCI



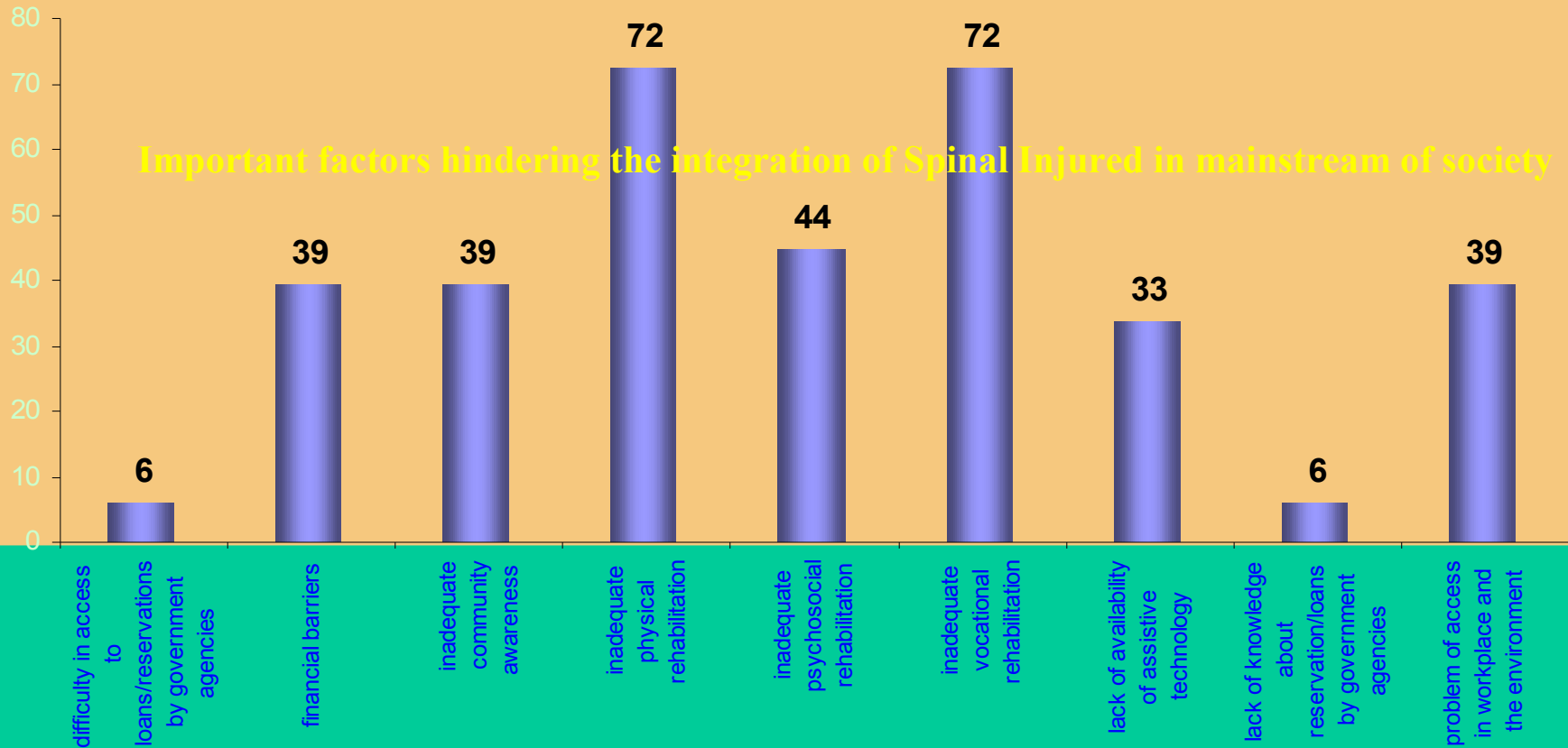
factors hindering management during hospitalization

- ❖ Financial constraints
- ❖ Patients not reaching the definitive institution specialising in management
- ❖ Lack of adequate facilities at definitive institution
- ❖ Psychological factors
- ❖ Illiteracy
- ❖ Inadequate patient education



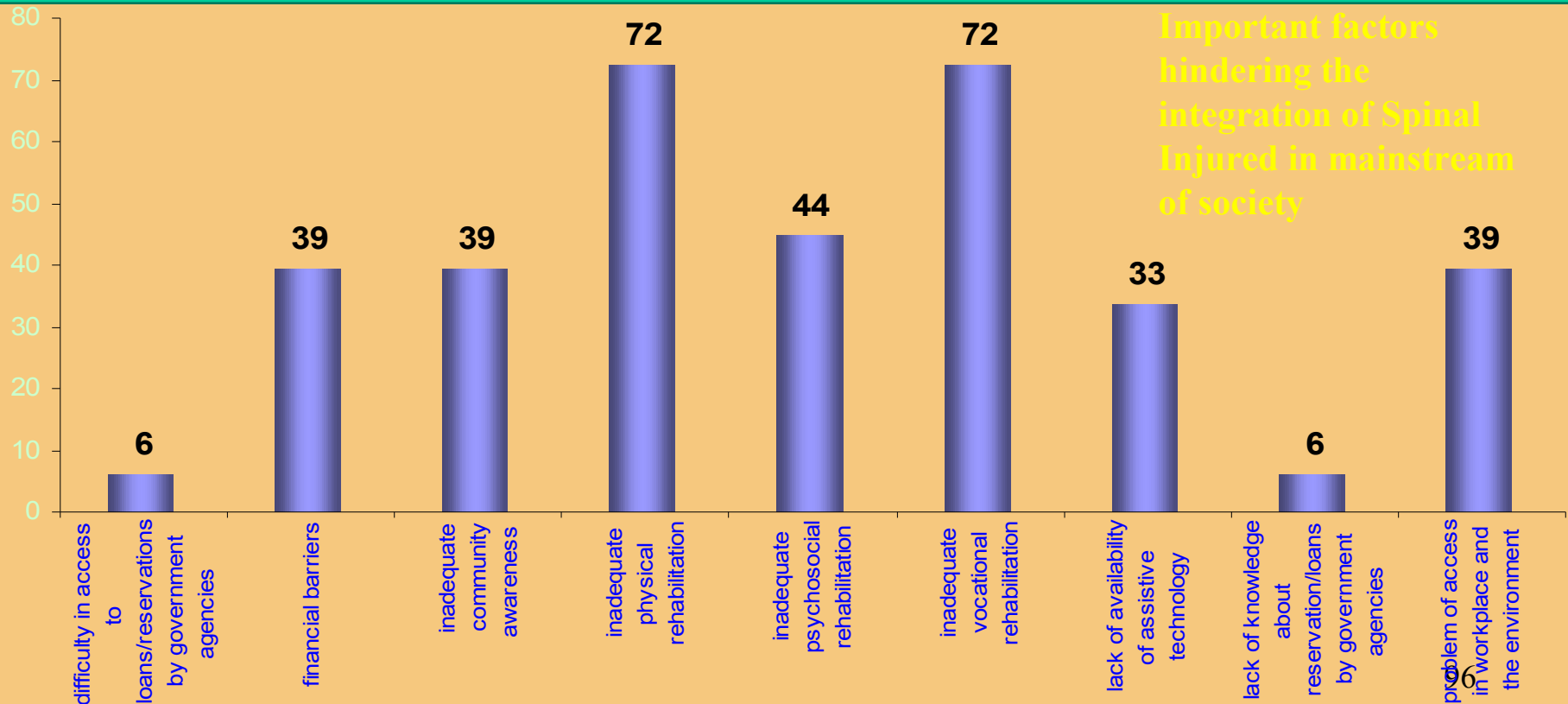
factors hindering integration of spinal injured in mainstream of society

- ❖ Inadequate physical rehabilitation
- ❖ Inadequate vocational rehabilitation
- ❖ Inadequate psychosocial rehabilitation
- ❖ Inadequate community awareness
- ❖ Financial barriers



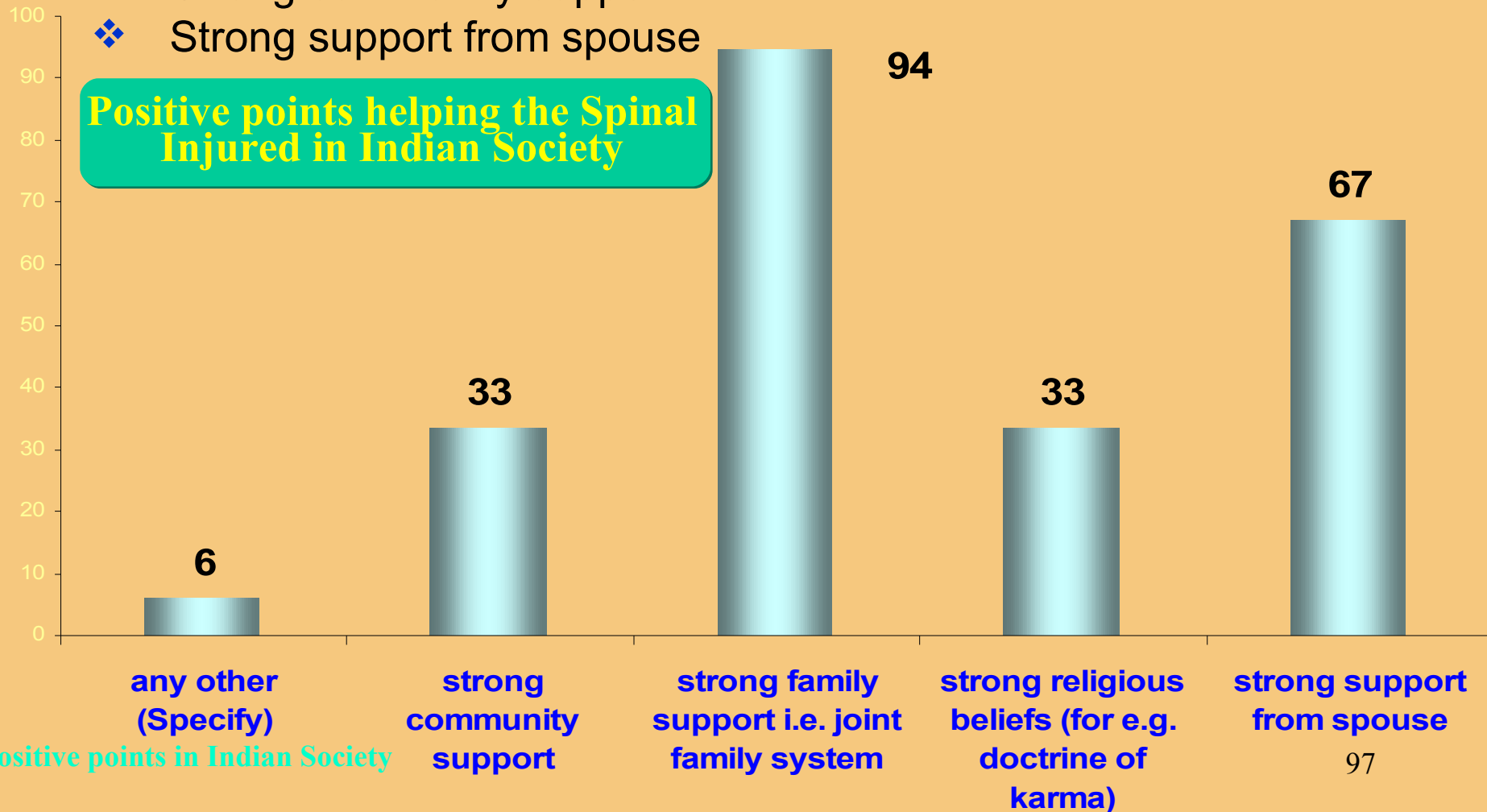
factors hindering integration of spinal injured in mainstream of society

- ❖ Problem of access in workplace and the environment
- ❖ Lack of availability of asistive technology
- ❖ Difficulty in access to loans / reservations by government agencies
- ❖ Irrational beliefs
- ❖ Lack of knowledge about reservation / loans by government agencies



positive factors in indian society favoring outcomes

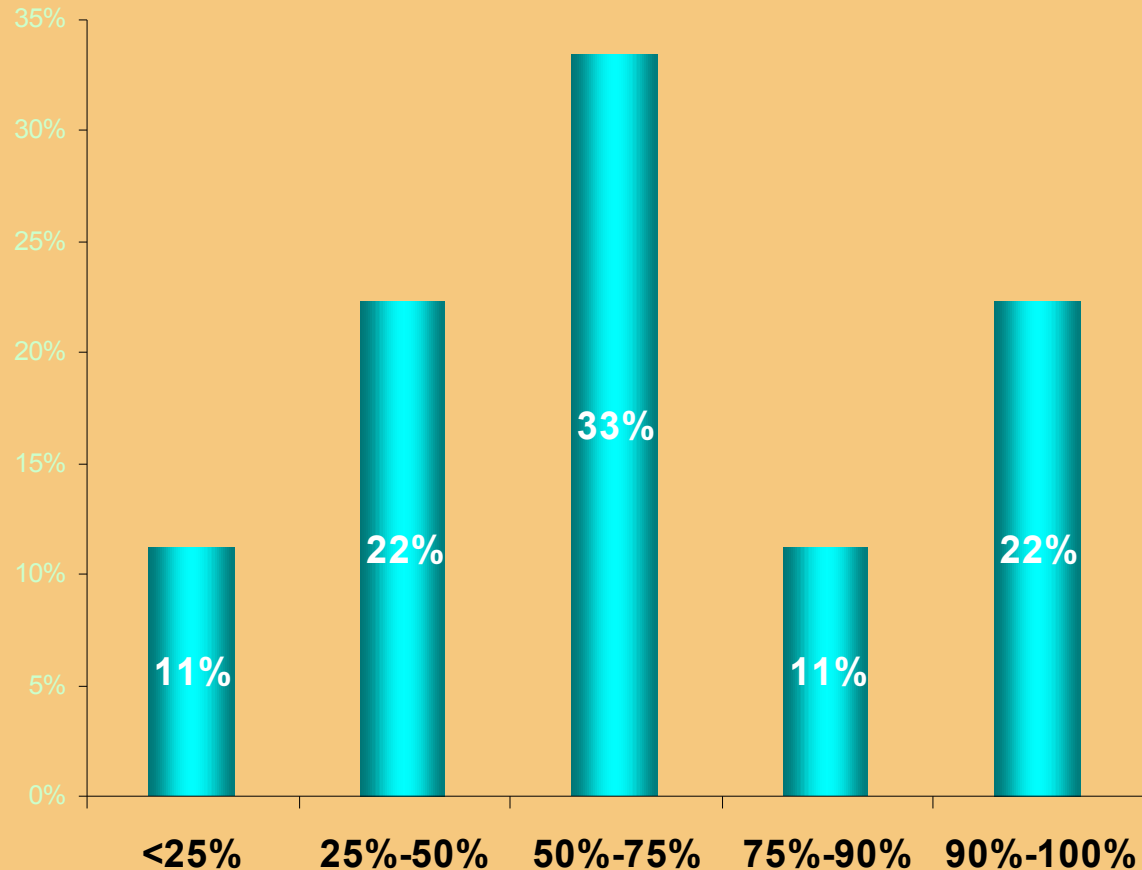
- ❖ Strong family support i.e. joint family system
- ❖ Strong religious beliefs (for e.g. doctrine of Karma)
- ❖ Strong community support
- ❖ Strong support from spouse



neglected areas of SCI management in INDIA

- ❖ Prevention
- ❖ First aid at site
- ❖ Evacuation from accident site
- ❖ Ventilatory management
- ❖ Adequate rehabilitation
- ❖ Psychosocial rehabilitation
- ❖ Sexual rehabilitation
- ❖ Fertility

spinal injured patients getting adequate rehabilitation

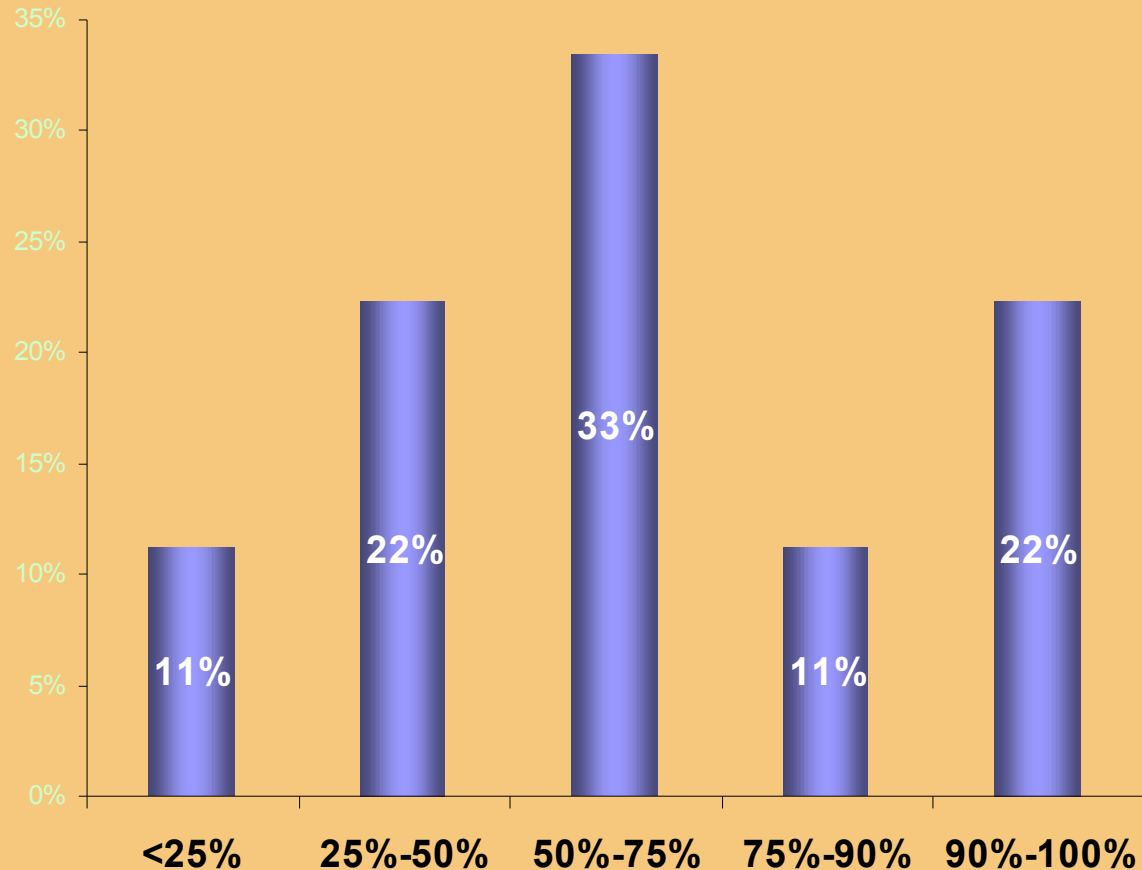


white paper on spinal injury management for opinion of the expert group

neglected areas of SCI management in INDIA

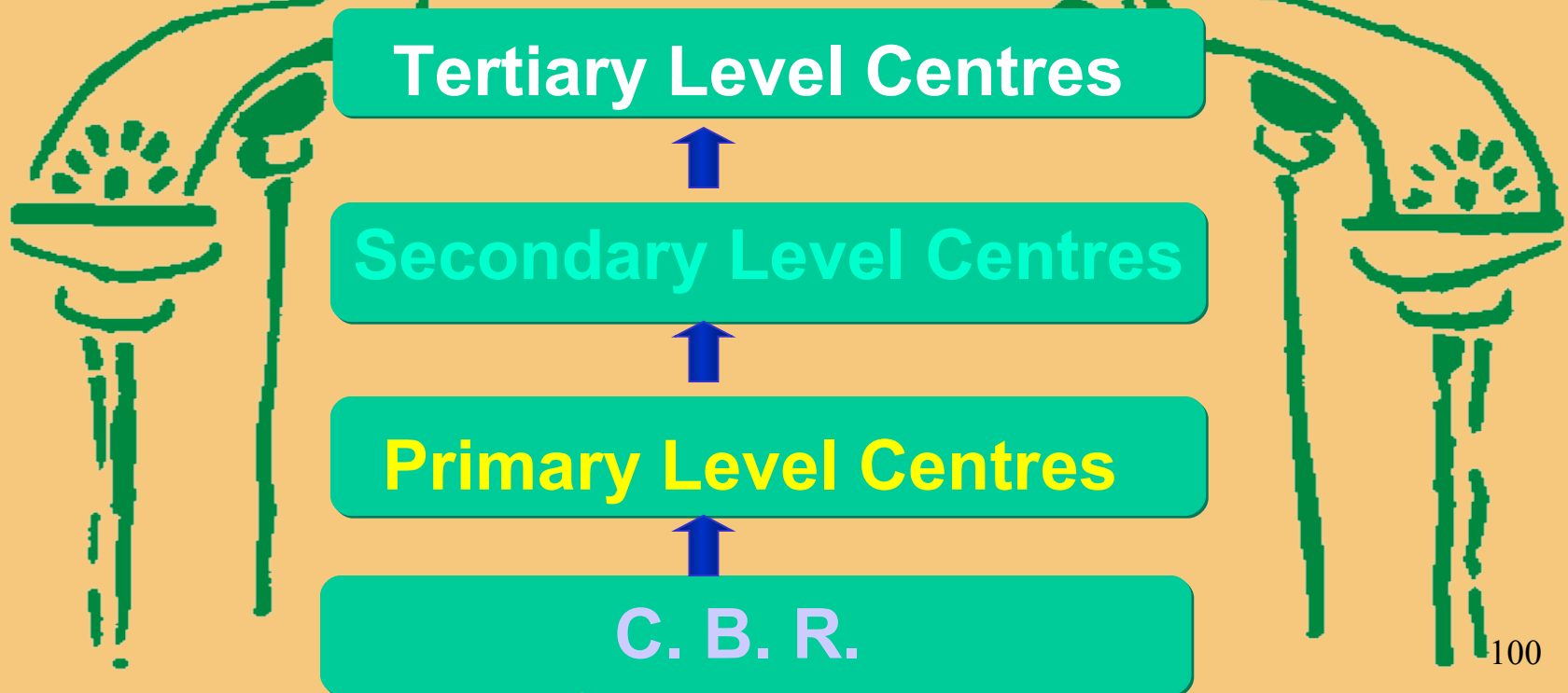
- ❖ Vocational training
- ❖ Pre-discharge home visit for modification
- ❖ Follow up home care service
- ❖ Follow up in hospital
- ❖ Integration into community
- ❖ Barrier free environment
- ❖ Implementation of Equal Opportunities Bill

spinal injured patients getting adequate rehabilitation



proposed organization of SCI services in INDIA

- Network of SCI Centres
- Pyramidal Organization



proposed organization of SCI services in INDIA

- ❖ define scope of activities at each level
- ❖ define catchment areas
- ❖ strengthening of already existing centres
- ❖ emphasis on training of personnel
- ❖ national SCI database

proposed scope of activities of community based rehabilitation (CBR)

- ❖ Community awareness about SCI and Prevention
- ❖ Pre discharge home visits for home modification
- ❖ Follow up home care services
- ❖ Education and assistance in loans / Schemes / Reservations
- ❖ Detection of neglected cases

proposed scope of activities of primary level centres (PLC)

- ❖ Comprehensive rehabilitation with stress on physical rehabilitation during chronic phase
- ❖ Teaching Institute for Community Based Rehabilitation
- ❖ Research
- ❖ Could also provide services to people with locomotor disabilities
- ❖ Public Awareness programs

proposed scope of activities of secondary level centres (SLC)

- ❖ Acute Management
- ❖ Conservative and Surgical Management
- ❖ Management of complications
- ❖ Comprehensive rehabilitation with stress on physical rehabilitation during acute and subacute phase
- ❖ Follow up of patients in their own Catchment area
- ❖ Teaching Institute for Primary Level Centre staff
- ❖ Research

proposed scope of activities of tertiary level centres (TLC)

- ❖ Referral cases
- ❖ Complicated and advanced surgeries – spine
- ❖ Management of serious and advanced complications
- ❖ Acute management of complicated cases
- ❖ Rehabilitation of complicated cases
- ❖ Teaching – Training of master trainers
- ❖ Advanced Research

role of government in organization of

SCI services in INDIA

- ❖ Community awareness
- ❖ Prevention programmes
- ❖ Awareness and Implementation of Equal Opportunities Bill
- ❖ Promote Education & Research
- ❖ Starting a “National Programme on Spinal Injury Management”

White Paper on Spinal Injury Management

Thank You

Dr. Harvinder S. Chhabra

Addl. Medical Director

Indian Spinal Injuries Centre