

Royal Hospital for
Neuro-disability

A national medical charity

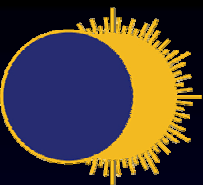
Sensory Stimulation and SMART

Can we Clinically Assess Awareness?

Helen Gill -Thwaites

Royal Hospital for Neuro-disability
London

International Symposium
Wachkoma 2008



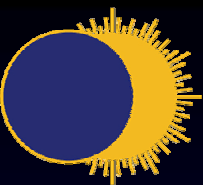
Overview of Presentation

- What is Sensory Stimulation?
 - Overview of SMART?
 - Essential Pre Requisites Elements to SMART?
 - *Assessor/Assessment/Patient/Family and Carers*
 - Benefits of SMART Clinical Practice?
 - Future SMART Projects
-

Sensory Stimulation

“Designed to heighten responsiveness through the application of environmental stimuli, by an external agent for the purpose of promoting arousal and behavioural responsiveness.”

Giacino 96



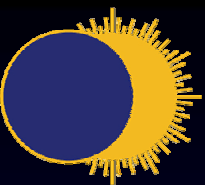
Sensory Stimulation

“Designed to prevent sensory deprivation
and to provide structured input in order to
maximise the patient’s to process information to the
stimulation.”

Malkmus 1980

Goal of Sensory Stimulation

“to facilitate recover of the nervous system so that the patient is able to process information to an increasing variety and complexity.”



Theory for Sensory Stimulation

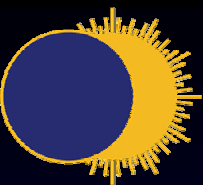
1. Spare capacity and reorganisation theory
2. The redundancy theory
3. Responses at cellular level theory
4. The environmental effect theory

Baker 88

Rationale for Sensory Stimulation

- Environmental Stimulation is needed in order to avoid sensory deprivation.
- Evaluating the patient's progress.
- Evidence of Success
- Provides a structured system of intervention for family and team.

Ellis, Alston, Rader 89



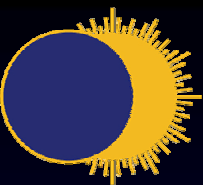
Structured sensory stimulation

- Systematically applied stimulus to one or more senses - Uni or Multi modal stimulation
- Efficacy of Uni or Multi modal dependent on patient (Wilson 93)
- Use familiar rather than unfamiliar stimuli
- Labour and time intensive
- Patients who are hyper responsive should not be exposed to stimuli causing response
- Nature, intensity and frequency controlled carefully, following detailed assessment

Structured sensory stimulation

Different stimuli used in research protocols

| | |
|-------------|--|
| Visual | flashing lights, bright coloured objects, mirror |
| Auditory | tapes of music, voices, nature sounds |
| Tactile | different materials-(fur, felt metal, cold and warm), tuning fork (vibration) |
| Olfactory | perfume, spices |
| Gustatory | lemon juice, salt |
| Kinesthetic | passive range of movement |



Cochrane review

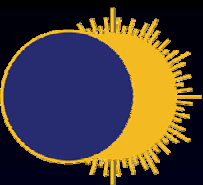
Conclusion

Most published research not providing sound scientific basis for Sensory Stimulation

Choice of outcome measures differ widely

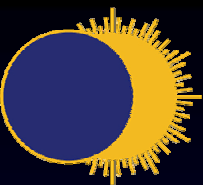
Inconsistent definition of coma and VS

No reliable evidence to support or disprove multi-modal sensory stimulation



- Aggressive early intervention (rehabilitation and sensory stimulation) indicated
- GCS not a sensitive tool for measurement of outcome
- Optimise arousal in Standing Frame/Tilt table

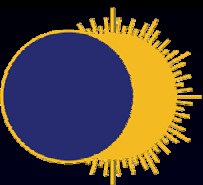
Gelling and Shiel et al 2004



Sensory Regulation

“a method to control the patient’s total sensory environment so that events are presented at a rate and in a manner that will reduce confusion and increase accessing systems that control perception and awareness.”

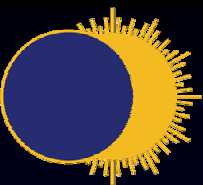
Wood 93



Sensory Regulation

- Processing information by nervous system dependent on integrity of neural system but also the quality of stimuli, intensity, duration and variability.
- Selective attention required to filter out noise.
- Need to provide an environment to enable selective attention.

Wood 91



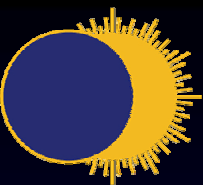
Vigilance

“a state of high grade efficacy of nervous system.
When vigilance is high the mind and body is poised in
readiness to respond to an internal or external event.”

Wood 91

“a state of readiness to detect or respond to small
changes occurring a random intervals in the
environment.”

Mackworth 68

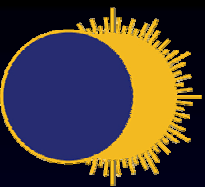


Vigilance

Vigilance can be maintained in the absence of high level arousal

It is vigilance rather than arousal which is the state out of which awareness can be derived.

Arousal and awareness are different conditions –
Sensory stimulations must not just work on increasing arousal but must also heighten awareness



Recommendations for Behavioural Assessment of Neuro-Cognitive Responsiveness

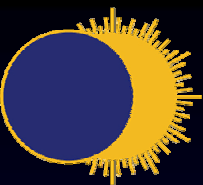
Sensory Regulation

- Address factors effecting arousal such as positioning and sedatives and nutritional needs
- Examine in a distraction free environment

Sensory Stimulation

- Administer adequate stimulation to maximise arousal
- A variety of different behavioural responses should be investigated using a broad range of stimuli.
- Observation of Family, carers and professional in assessment procedure.

Giacino, Aswal et al 2002



Sensory Regulation

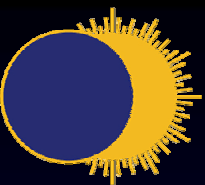
- Regulates patient environment, prior to, during and after assessment
- Educates families, team and carers in sensory regulation

Sensory Stimulation

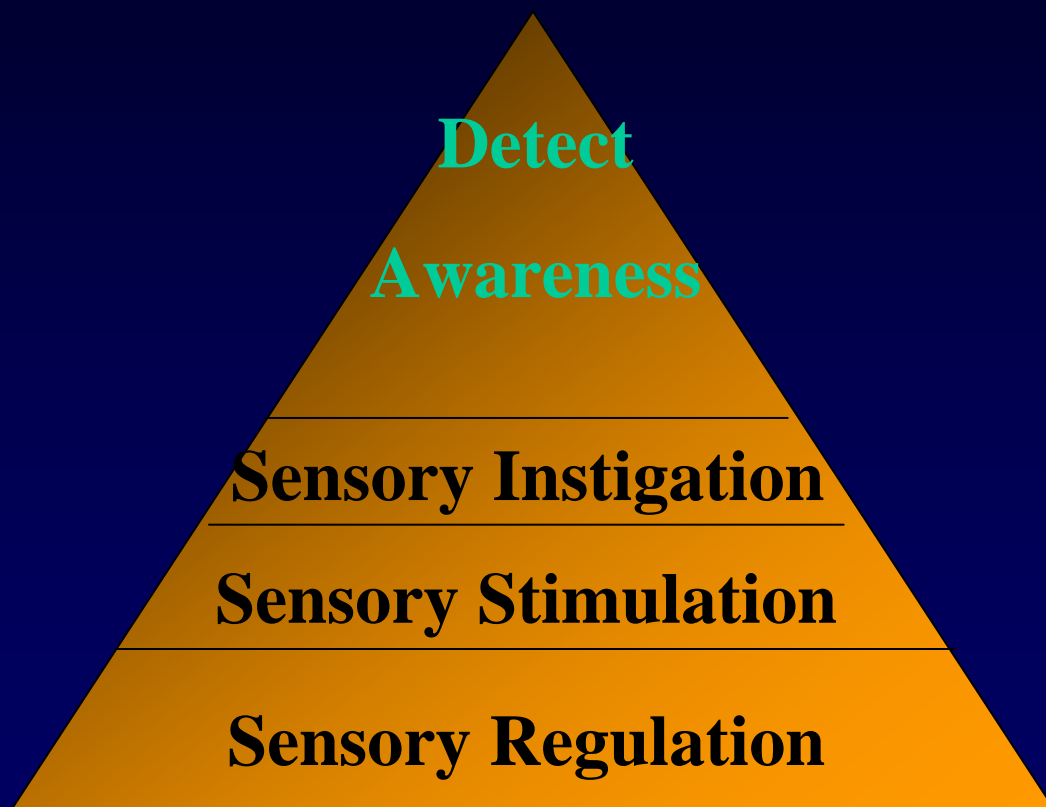
- Extensive structured stimulation over all modalities, ensuring not over stimulation
- Increase arousal and awareness through standardised approach

Sensory Instigation

- To “urge on” a positive response and detect awareness

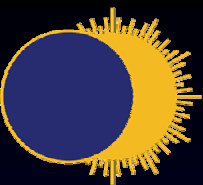


Model for SMART Assessments



Key Components

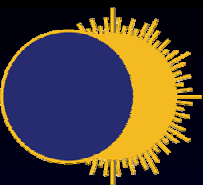
- **Assessment Tool**
- **Assessor**
- **Family/Team Involvement**
- **Environmental Factors**
- **Patient Factors**



Overview of SMART

SMART is a standardised assessment and treatment tool for the low awareness patient designed to:

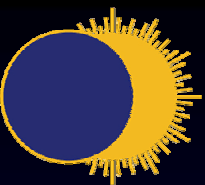
1. Provide comprehensive assessment of motor, sensory and sensory responses.
2. Identify essential pre requisite elements which need to be addressed to optimise quality and frequency of responses
3. Identify evidence of awareness
4. Provide a suggested Diagnosis
5. Formulates a structured treatment plan to optimize patient potential.
6. Involves family and team in process



Sensory Modality Assessment and Treatment Technique

- Designed specifically for LAS Patients
- Detected 43- 35% misdiagnosis
- Recommended in RCP guidelines 2003

Gill-Thwaites and Munday 1995 and 1997



SMART Informal and Formal Components

SMART Informal

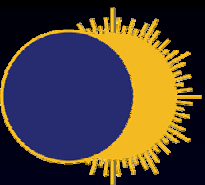
Lifestyle and History Questionnaire

SMART Informs

SMART Formal Assessment

Behavioural Observation

Sensory Assessment



SMART Formal Assessment

- Behavioural Observation

- Sensory Assessment

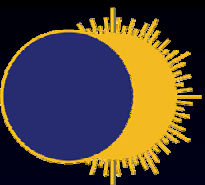
10 assessments over 3 week period

SMART Informal Assessment

- Family Observation/Team Involvement

Treatment Programme – 8 weeks

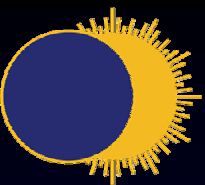
SMART Re -assessment



5 Sensory Modalities:

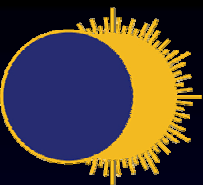
- Hierarchical 5 point scale comparable across each Sensory Modality

- Vision
- Auditory
- Tactile
- Olfactory
- Gustatory



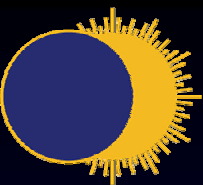
Summary of Behavioural Sensory Modalities

- **Motor Function**
- **Communication**
- **Wakefulness / Arousal**



SMART Visual Techniques

1. Pupil Response to Light
2. Blink to Light
3. Response to threat
4. Focussing on stimuli
5. Tracking of stimuli
6. Tracking of Assessor
7. Following written instruction
8. Ability of AF Switch (written instruction)
9. Visual Differentiation of stimuli (written instruction)



SMART Visual Modality

- SMART Level 1 No Response

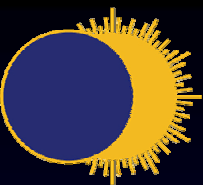
No Eyes closure to light or threat.

No pupil response

- SMART Level 2 Reflexive Response

Pupil/s constrict to light

Mass Flexion/Extension



SMART Visual Modality

- SMART Level 3

Withdrawal response.

Eyes close to light.

Eyes close to threat.

Head turn away.

- SMART Level 4

Localising level.

Focus on stimuli

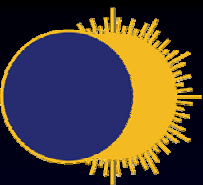
Visual tracking.

- SMART Level 5

Differentiating level.

Follow written instruction.

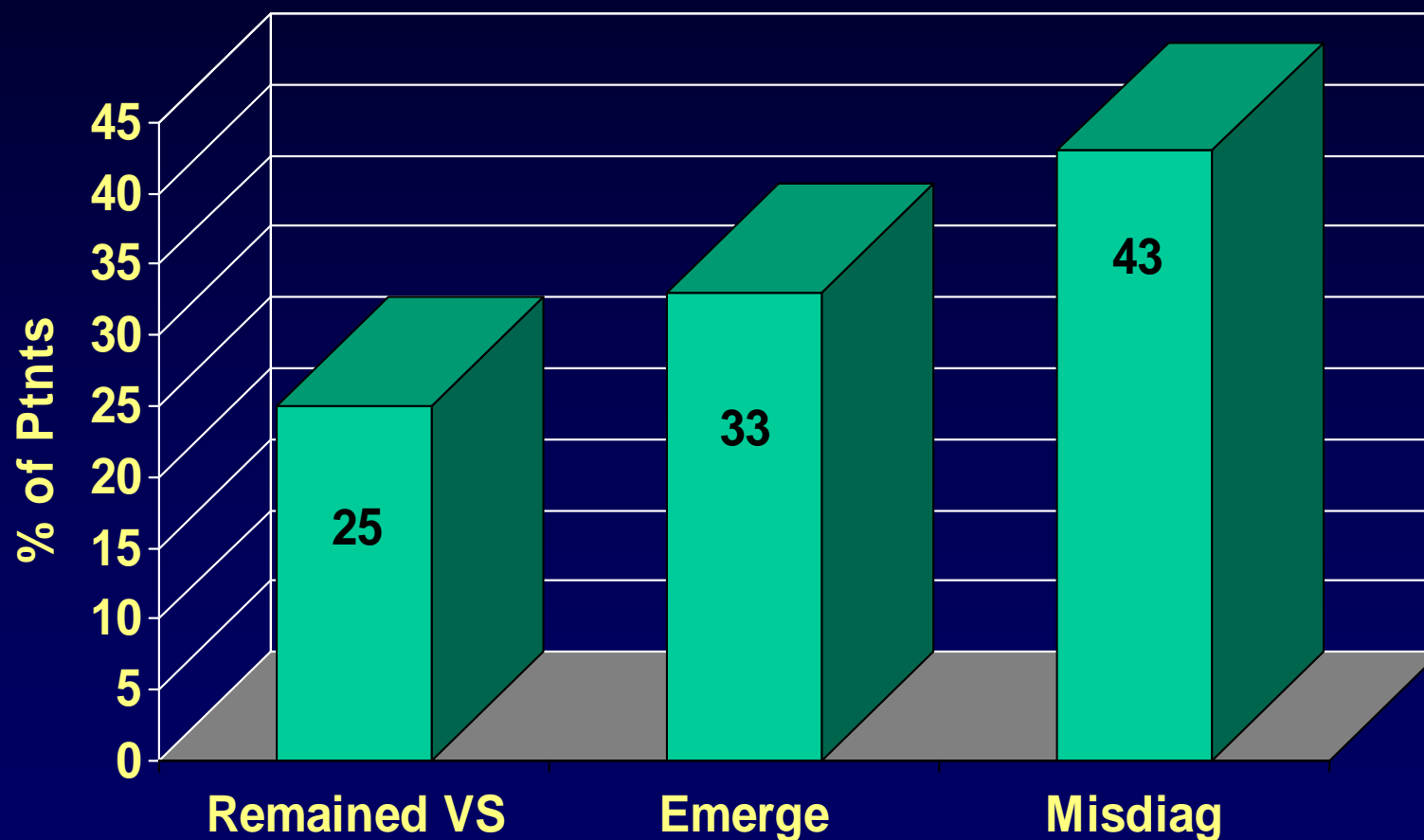
Visual discrimination

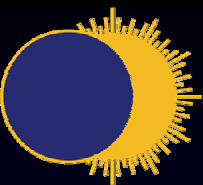


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Outcome of those Referred as Vegetative (n=40)

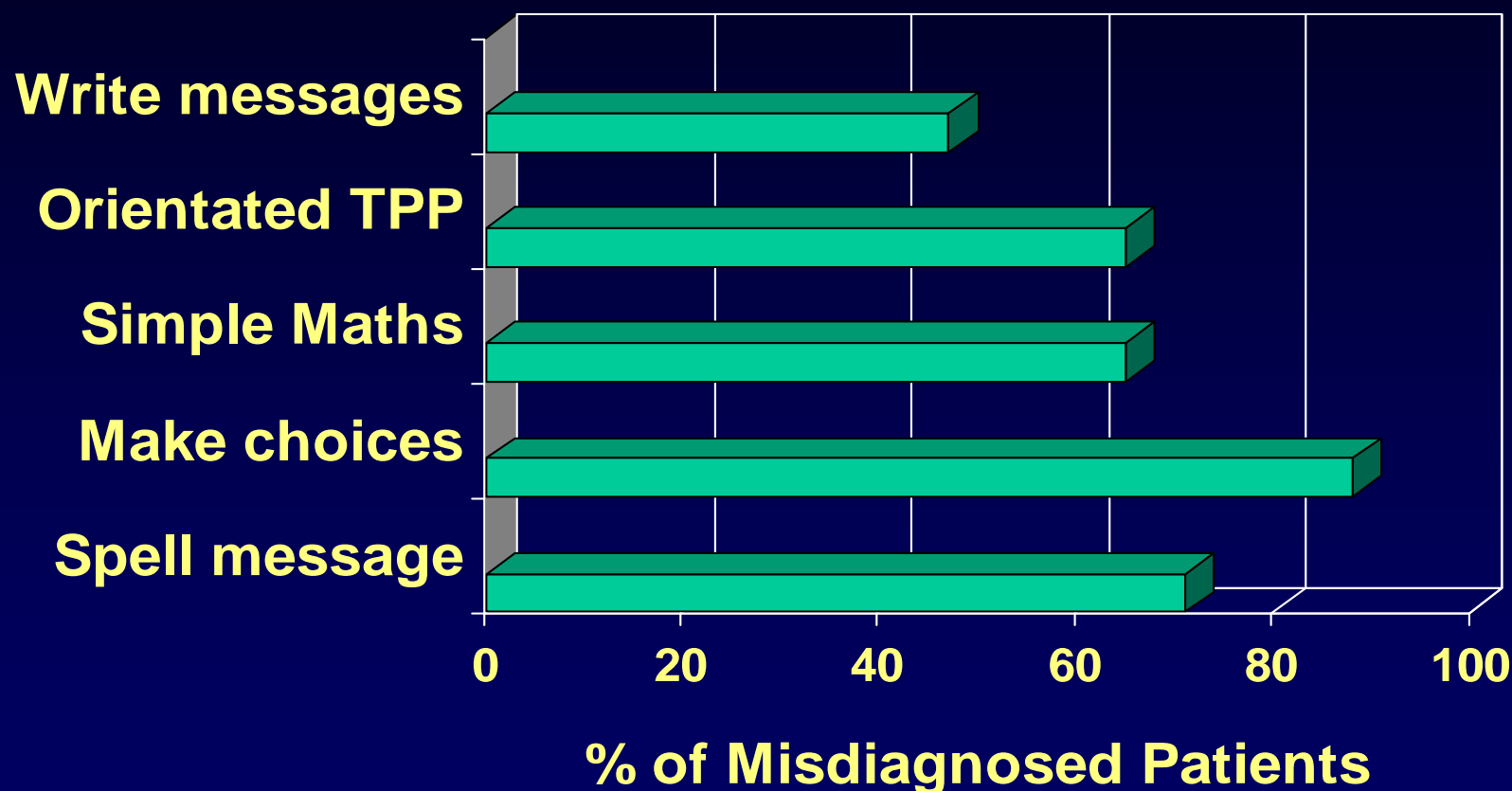


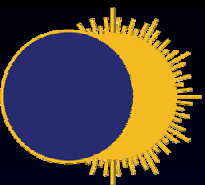


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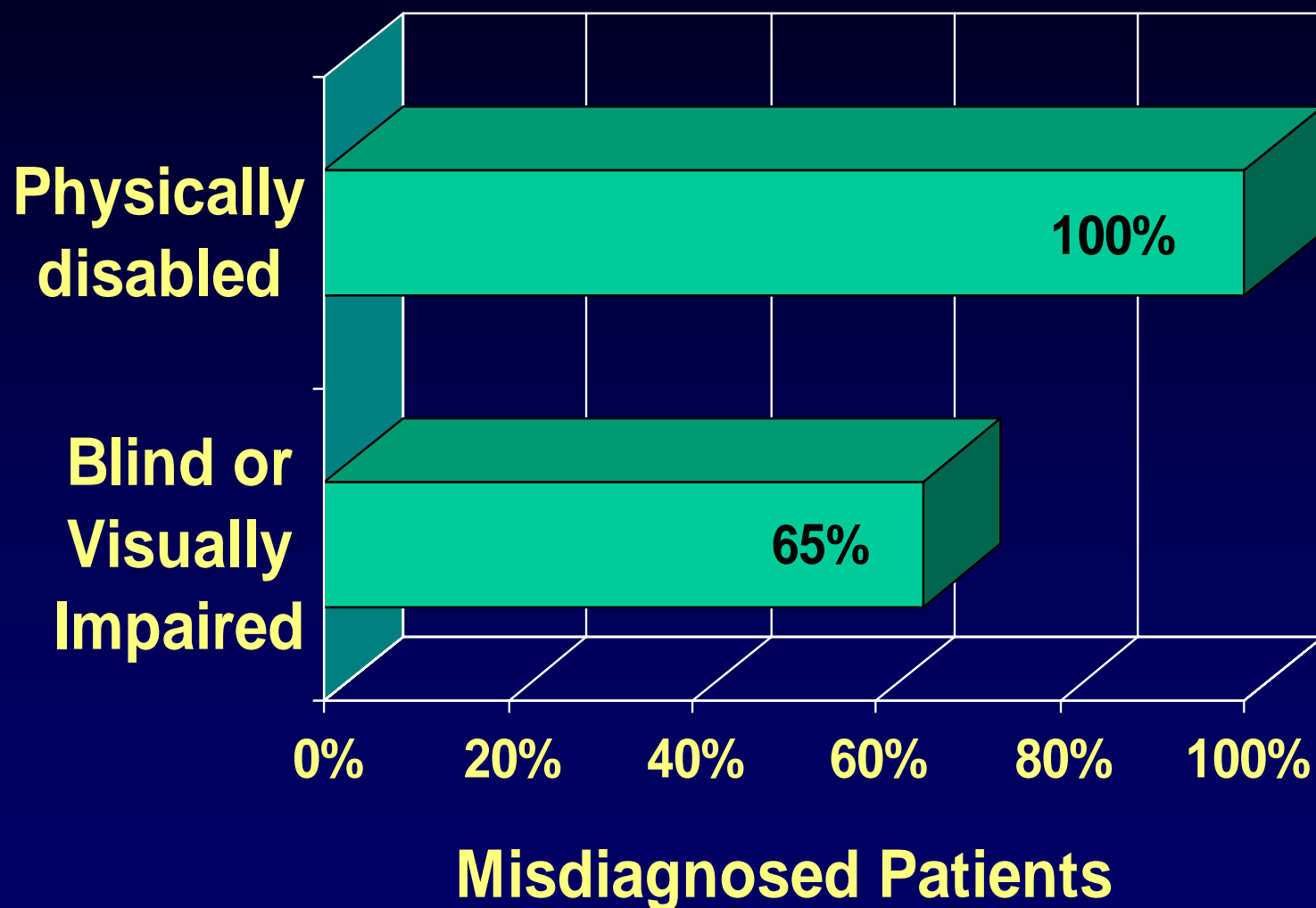
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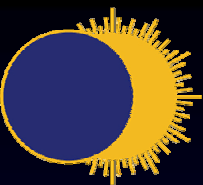
Outcome of Misdiagnosed Patients





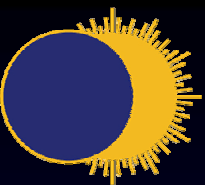
Characteristics OF Misdiagnosed Group





SMART Unique Features

- Identifies Awareness
- Provides suggested Diagnosis
- Hierarchical Scale
- Comparable and Equal across Modalities
- Score each of the 8 modalities individually
- Provides a Treatment programme
- Re assessment for comparison to baseline



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SMART Model Pre Requisite Essential Elements (PREe)

Detect

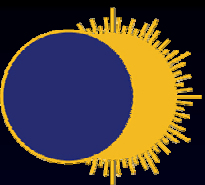
Awareness

Family/Carers

Patient Issues/Environment

Assessment Tool

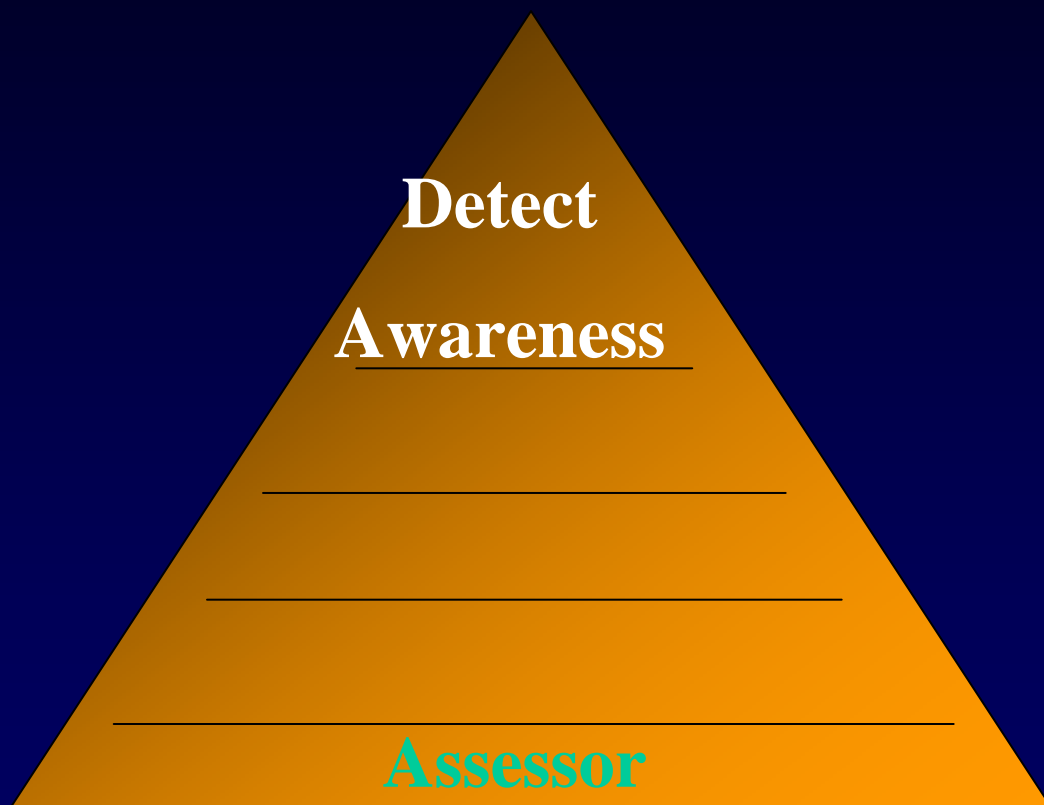
Assessor

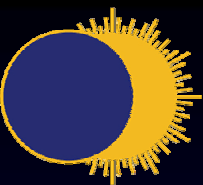


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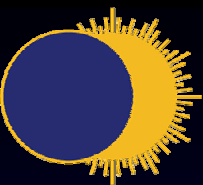
SMART Model Pre Requisite Essential Elements (PREe)





Assessor Considerations

- **Knowledge**
 - Terminology
 - Differential Diagnosis
- **Experience**
 - In Neurological Field
- **Familiarity**
 - with Patient/Family/Team
 - Of standardised Assessment Available
 - Application of Standardised Assessments
- **Skills**
 - Observational
 - Facilitation
 - Environmental Factors Considerations
- **Availability**
 - for Frequent Assessment

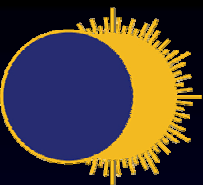


Assessor Familiarity

Minimally Conscious State

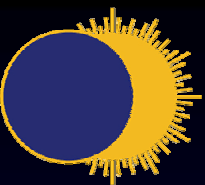
“Severely altered consciousness in which the patient does not meet the criteria for coma or the vegetative state because there is inconsistent but reproducible or sustained behavioural evidence of self or environmental awareness”

Aspen WP 2001



Assessor analysis of behaviours needs to discriminate:

- **Reproducibility**
- **Consistency**
- **Complexity**
- **Meaningfulness of responses**



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Assessor Pre Requisite Essential Elements (PREe)

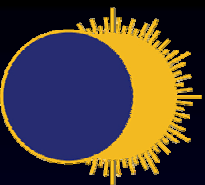
**Standardised and
Effective Assessment**

Reaccreditation

Complete Portfolio

Attend SMART Course

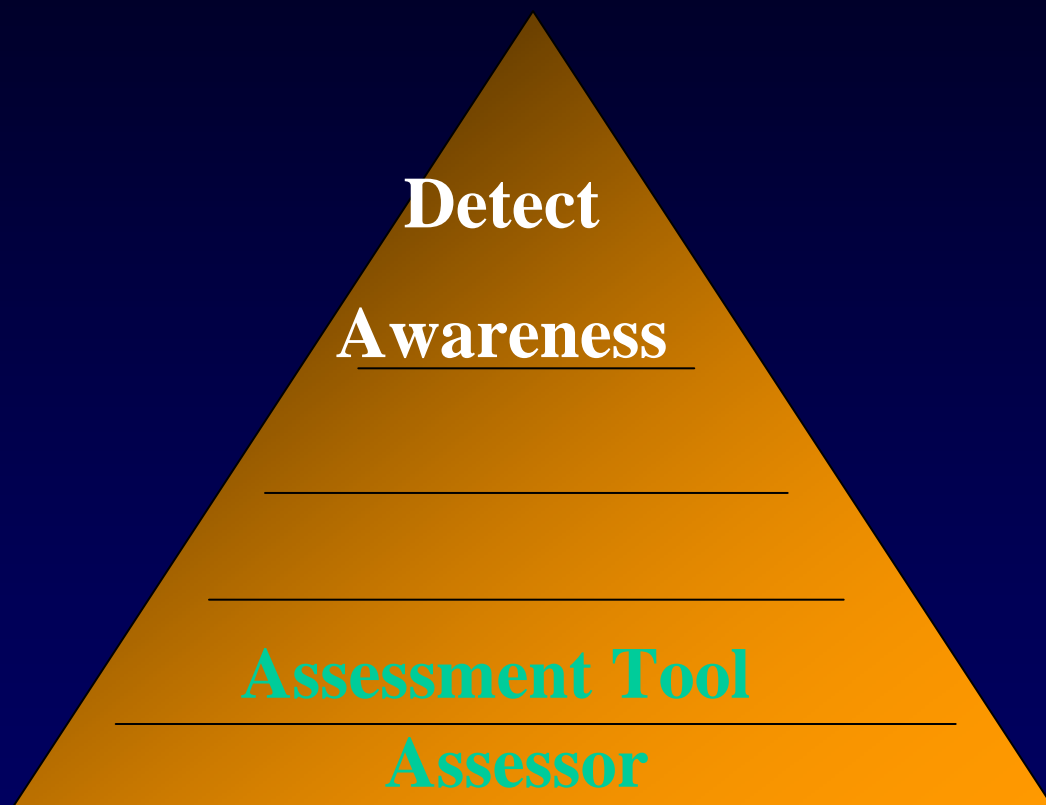
Person Specification

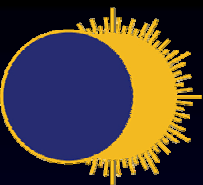


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SMART Model Pre Requisite Essential Elements (PREe)



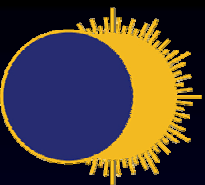


Assessment Considerations

- Standardised assessment not Implemented
- Not designed Specifically for VS/MCS
- Limited Presentation of Stimuli
- Lack Sensitivity
- Scores are added to make Total Score
- Patients Ability Masked by Scale

The tools do not :

- allow Comparison across modalities
- define frequency of Assessment
- discriminate Awareness
- Involve Family and Team systematically in process

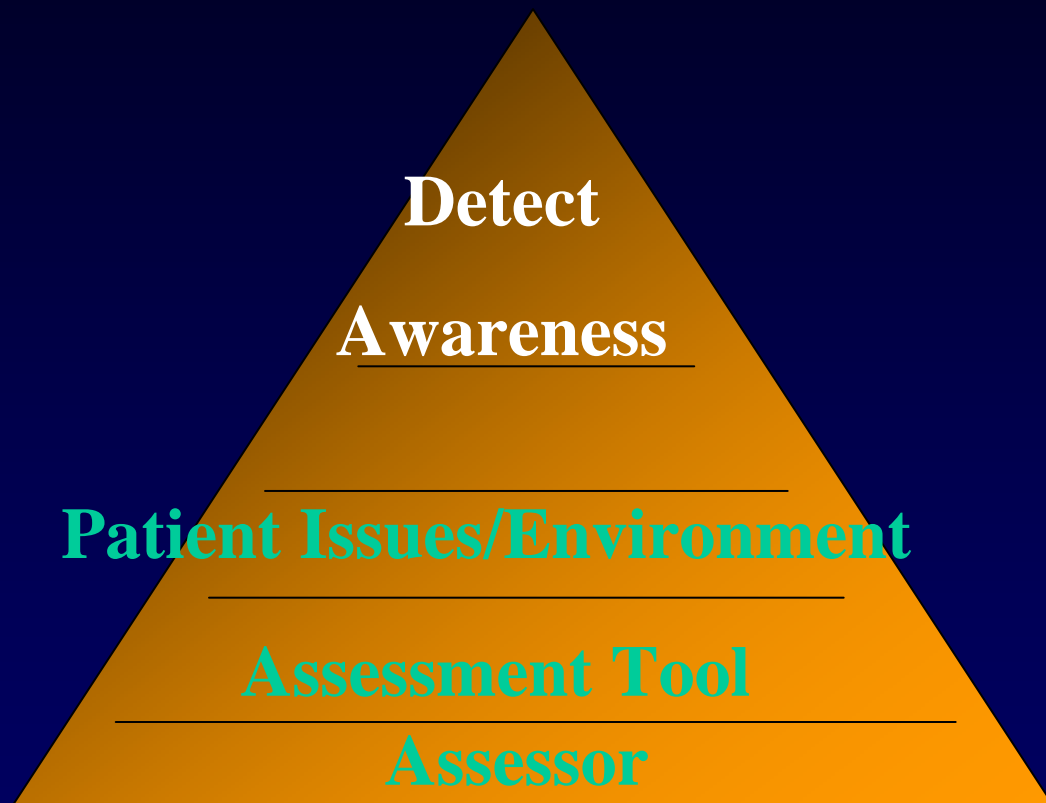


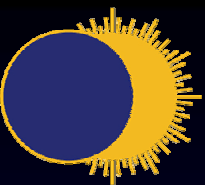
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SMART Model

Pre Requisit Essential Elements (PREe)





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SMART Patient Pre Requisit Essential Elements



Patient Considerations

Internal Issues

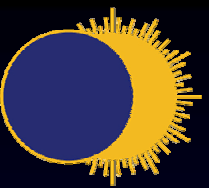
- Medication
- Fatigue
- Nutritional Status
- Too ill
- Physical Ability to respond
- Sensory Ability to respond e.g. Cortical Blindness

Psychological Issues

- Desire/Willingness to Respond

Environmental Issues

- Patients Positioning in Bed and Chair /Masked Ability
-



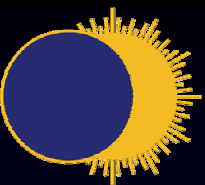
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Sub Optimal Bed Positioning



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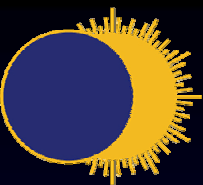
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Optimal Bed Positioning

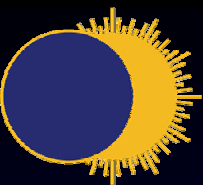


International Symposium
Wachkoma 2008



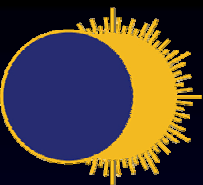
Environment

- Controlled environment for assessment and day to day activities
- No environmental over stimulation/ rest periods
- Release any restrictive straps and splints where applicable
- Distraction free environment for assessment
- Assessor and family educated for optimal environmental set up



Approach

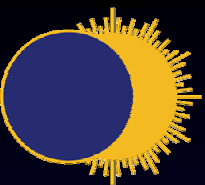
- Talk to patient as if they understand – in an appropriate manner
 - Tell the patient what is going to happen before action taken
 - Remove all external stimuli which might distract from activity
 - Present one stimuli at a time
 - Ensure all involved take correct approach
-



Approach

- ‘ they treated me as if I was stupid’
- ‘ my stay ... was absolute hell they never told me anything’
- ‘ they used to suction me through my mouth...never told me why’
- ‘I can’t tell you how frightening it was’
- ‘ you need to be told where you are every day’
- ‘ tell them things every time you do it, especially if it hurts’
- ‘ don’t laugh... I found it offensive’
- ‘ all I could hear was noise- not words’

Wilson et al 2001



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SMART Model Family/Carers

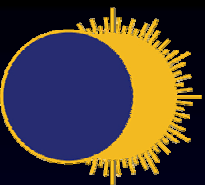
Detect

Awareness
Family/Carers

Patient Issues/Environment

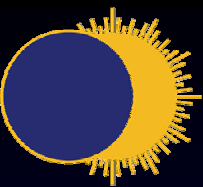
Assessment Tool

Assessor



Case Study

- Sex Male
 - Age 64 Years
 - Diagnosis VS secondary to
 Hypoxic Brain Damage
 - Time Since Onset 7 years
 - Length of
Admission 8 months
-



Case Study

Status Prior to Admission

Patient

- Diagnosed VS

Assessor

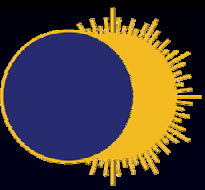
- Experienced Physician

Patient Environment

- Managed in Bed for 7 years
- No specialized adaptations for Bed and No wheelchair

Assessment Tool

- No results from standardized Assessment



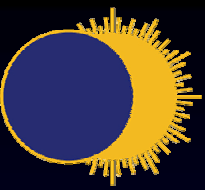
Case Study

Management on Admission

- Patient Status Optimized
 - Medical Status
 - Drug Regime Review
 - Nutritional Status

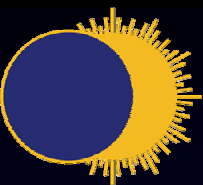
Postural Management Programme

- Bed
- Wheelchair
- Splinting



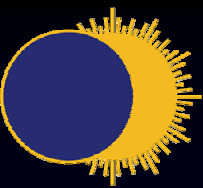
Behavioural Observation Assessment

- Eyes Open for 45% of time
- Mass Flexion Pattern Only
- No spontaneous or purposeful movement



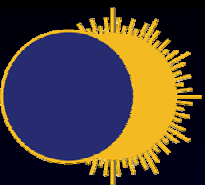
SMART Sensory Assessment Assessment

| | | |
|------------------|-------------------------|---------|
| • Visual | No response | Level 1 |
| • Auditory | Differentiating | Level 5 |
| • Tactile | Withdrawal | Level 3 |
| • Olfactory | Withdrawal | Level 3 |
| • Gustatory | Withdrawal | Level 3 |
| • Motor Function | Inconsistent Purposeful | Level 4 |
| • Communication | Non Specific | Level 2 |
| • Arousal | Medium Arousal | Level 3 |



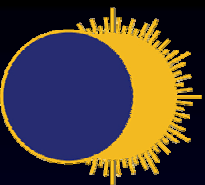
Case Study SMART Treatment Plan

- Twice daily motor instruction press switch
- Link to Yes /No
- Biographical Questions
- Letter Recognition
- Letter to Wife
- Planning Day
- Training Family
- Computer Assessment
- Training Care Home



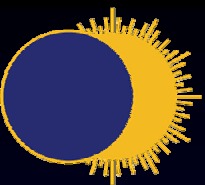
Case Study and Guidelines Overview: Essential 3 Components

| Essential Component | Guidelines | Case Study: Pre Admission | Case Study: Post Admission |
|-----------------------|------------|---------------------------|----------------------------|
| Assessor Experience | Yes | Yes | Yes |
| Assessor Skills | No | ? | Yes |
| Assessor Availability | No | No | Yes |
| Familiarity | No | No | Yes |

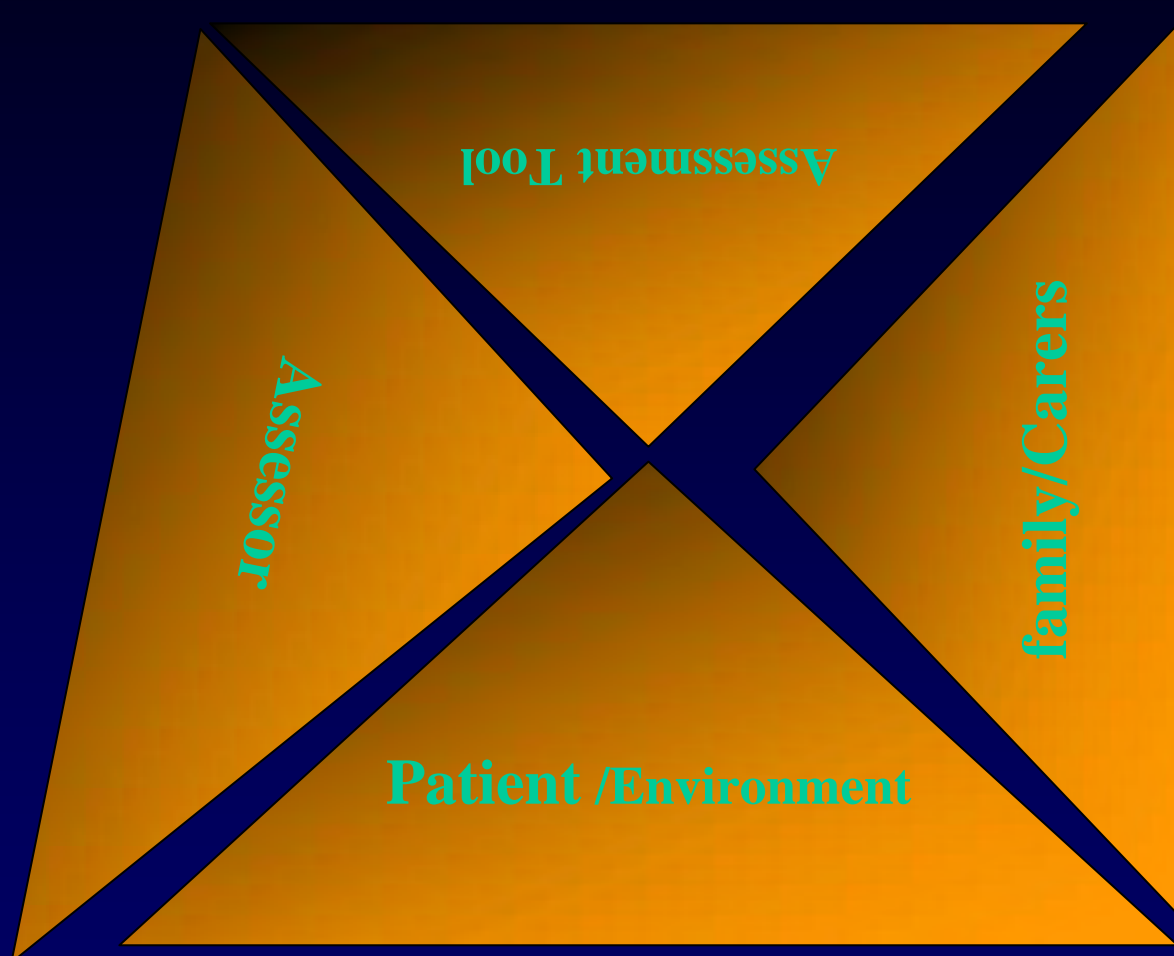


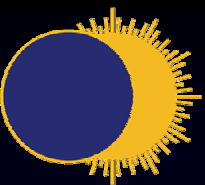
Case Study and Guidelines Overview: Essential 3 Components

| Essential Component | Guidelines | Case Study: Pre Admission | Case Study: Post Admission |
|------------------------------|------------|---------------------------|----------------------------|
| Patient Factors | Not Fully | No | Yes |
| Environmental Factors | No | ? | Yes |
| Assessment Tool Standardised | No | No | Yes |
| Frequent Application | Not Fully | No | Yes |



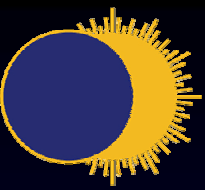
PREe SMART Model





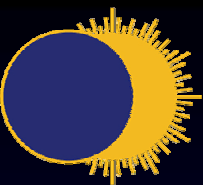
Future SMART Developments

- Computerised Behavioural Programme
- SMART Relatives /Carers Tool
- Treatment Planning Manual



SMART Details

- www.rhn.org.uk under section of Institute
- hgill@rhn.org.uk
- NHS Innovation Awards nomination 2008



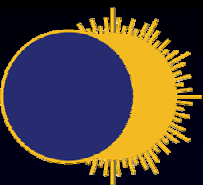
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