Evidence-Based Cognitive Rehabilitation of Brain Injury

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What is Cognitive Rehabilitation?

The attempt to remediate impaired cognitive functions by:

1. Thoroughly evaluating current deficits

2. And either strengthening and re-establishing previously learned patterns of ability

3. Or establishing new patterns by means of compensatory strategies.

4. No time post-injury when TBI patients can't benefit from cognitive rehabilitation.

Two Models of Cognitive Rehabilitation

- Restoration of Function
  - Direct Training
- Compensation
  - Internal strategies
  - External aids
  - Strategies for severe impairment

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Targets of Cognitive Rehabilitation

- Memory

- Executive Functioning: abstract reasoning, problem solving, organizing, planning

- Attention/concentration

- Visuospatial skills

- Language

Goals of Cognitive Rehabilitation

- Promote functional improvement in a way that is meaningful and relevant

- Rehab is conducted in a four step process:
    1. Awareness, and collaborative goal development
    2. Restoration or Compensation
    3. Internalization
    4. Generalization

1.Awareness and Collaborative Goal Development

- Recognizing specific problems that require intervention. Awareness and goal setting is a major therapeutic priority; foundation for most interventions. Without it, patient remains unmotivated

- Collaborating to establish meaningful short and long term goals. Could involve restoration or compensation.

2. Restoration and Compensation

- Restoration by direct training.

- Compensation provides clients with the necessary tools to compensate for their impairments and functional limitations.

  o These include both internal and external strategies. Learn new ways to do old tasks.

  o These tools must become healthy habits that enable individuals to resume daily life tasks.

Examples of Compensation

- Strategic: Those that focus on learning strategies that can be used to compensate for cognitive deficits.
  - External: Those that are external to the pt, e.g., notebooks, electronic devices, computers, etc.
  - Internal: Those that are self-generated for the purpose of enhancing conscious control over thoughts, behaviors, emotions, etc.
- Task Specific: Those that focus on skills that are necessary to perform a single task. For severe impairment.

Metacognitive Strategy Training

- "Metacognitive" is thinking about thinking

- Refers to awareness of one's own thinking and one's cognitive processes, e.g., memory, attention, etc. Ability to step back and view them objectively.

- Metacognitive strategy training is a compensatory strategy aimed at restoring one's ability to consciously set goals, plan, execute and self correct.

3. Internalization

- The clinical process of gradually making strategies automatic and reflexive, without need for external aids. This facilitates independence through the use of compensatory strategies and tools.

- Ultimate goal is to help the client to internalize strategies. Not always possible.

4. Generalization

- The application of lessons learned in the clinic to management of deficits in personally relevant areas of everyday situations.

- A skill is said to be generalized when it can be produced in a variety of real life contexts.

ACRM Cognitive Rehabilitation Manual

- Since 2000, the ACRM, under Dr. Keith Cicerone, has published a series of research reviews in the area of cognitive rehabilitation and has made recommendations about evidence based practice.

- In 2012, the ACRM published a manual of cognitive rehabilitation that incorporates these recommendations in a way that therapists can use.

- Since then, it has been adopted by most of the major rehab centers in the U.S. and is being used on at least four continents.

Features of the ACRM Cognitive Rehabilitation Manual

- For each cognitive area, the manual took the ACRM recommendations and developed a comprehensive protocol to implement them.

- Chapters on the principles of cognitive rehabilitation, as well as the treatment of deficits in memory, attention, executive functions, hemispatial neglect, and social communication.

Features of the ACRM Cognitive Rehabilitation Manual, Cont'd

- Emphasizes the coordination of long-term strategic goals and short-term tactical goals.

  - Strategic goals reflect the broad overall approach taken to address a particular area of deficit

  - Tactical goals are the specific means by which the strategic goal is implemented. These goals include the type of task, the complexity of the task, the level of support needed, a measure of success (accuracy or speed), and the type of strategy used.

REHABILITATION STRATEGIES IN MEMORY, EXECUTIVE FUNCTIONS AND ATTENTION

ACRM Recommendations for Treatment of Memory Deficits

- <u>Practice Standard</u>: Memory strategy training is recommended for mild memory impairment after TBI including external memory compensations and internal strategies

- <u>Practice Guidelines</u>: Use of external compensations with direct application to functional activities is recommended for people with severe memory deficits after TBI or stroke.

ACRM Recommendations for Treatment of Memory Deficits

Practice Option:

- For people with severe memory impairments after TBI, errorless learning techniques may be effective for learning specific skills or knowledge, with limited transfer to novel tasks or reduction in overall functional memory problems

- Group based interventions may be considered

Strategies in Rehabilitation of Memory

- Internal compensations (Mild)

- External compensations (Mild or Severe),

- Strategies for Severe Impairment

  - Errorless Learning, Spaced Retrieval, Chaining. (Severe only)

Internal Strategies

- Verbal mnemonics
  - E.g., first letter technique
  - HOMES= Huron, Ontario, Michigan, Erie, Superior
- Visual Imagery
  - Visual association
  - E.g., Method of Loci

External Compensations

- Memory Notebook (Mild or severe)
    - Can be paper or electronic device, e.g., cell phone, pager, computer, etc.
    - Comprises the core of external memory compensations.
    - Includes: Things to do, Memory log, Daily schedule, Calendar, Homework, History and background, Handouts, Contact info.

General Guidelines for External Memory Strategies

1. Need constant and easy access to the external device or notebook

2. All staff and family needs to be trained

3. Severely impaired pts will need errorless learning and simpler devices

4. It may take a lot of time to learn the device

5. Pts need a minimum level of awareness

General Guidelines for External Memory Strategies

6. Executive dysfunction, if present needs to be addressed

7. External devices need to be applied to functional tasks in everyday life

8. Cues will be needed early in treatment and faded over time.

Strategies for Severe Impairment

- Task specific. Provides information in a specific context only. Doesn't generalize.

- Therapist repeatedly presents one simple bit of information. Asks patient to repeat it. Best if recall time is progressively extended.

- Makes use of implicit memory. Patients won't remember that they have learned the information but will be able to show that learning has taken place.

General Techniques in Memory Rehabilitation

- Encourage patient to repeat information
- Cue to write information down
- Reinforce constant access to external memory aid
- Provide multiple learning and generalization trials
- Provide training of all staff and family

Executive Functions: Definition

- Central cognitive processes that determine goal-directed and purposeful behavior

- Decide upon and coordinate our cognitive, behavioral and emotional responses to events

- Include ability to formulate goals, solve problems, anticipate consequences, plan and regulate behavior.

- Enable adaptation to new situations

ACRM Recommendations for Treatment of Executive Deficits

Practice Standard:

Metacognitive strategy training (self monitoring and self-regulation) for deficits in executive functioning post TBI including impairments in emotional self-regulation and as a component of interventions for deficits in attention, memory and neglect.

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ACRM Recommendations for Treatment of Executive Deficits, cont'd

Practice Guideline:

• Training in formal problem-solving strategies and their application to everyday situations and functional activities during post-acute rehabilitation after TBI

ACRM Recommendations for Treatment of Executive Deficits, cont'd

<u>Practice Option</u>

- Group based interventions may be considered for remediation of executive and problem-solving deficits after TBI

Strategies in Rehabilitation of Executive Deficits

- Increase awareness of deficits
  - E.g., Predict-Perform Technique

- Metacognitive Strategy Training
  - Self-talk, self-monitoring and self-regulation

- Formal problem solving training
  - (Goal-Plan-Do-Review…Stop-Think-Plan)
    - Be aware of the problem
    - Plan out a solution
    - Execute the solution
    - Review the outcome

Metacognitive Strategy Training

- Self talk
- Self monitoring
- Self regulation

Formal Problem Solving Strategy: Goal, Plan, Do, Review

- Goal: What do I want to accomplish?

- Plan: How am I going to accomplish it? List all the steps.

- Do: Execute the plan

- Review: How did I do? What worked? What didn't? How should I do it differently next time?

Specific Techniques to Promote Executive Functions

- Establish structure

- Set goals

- Break down tasks into smaller steps

- Use check lists

- Give direct feedback

- Have patients use self-questioning

- Problem-solve step by step

ACRM Recommendations for Treatment of Attention Impairments

- <u>Practice Standard</u>
  1. Remediation of attention during post-acute stage
  2. Remediation after TBI by direct attention training, Attention Process Training
  3. Strategy Training: TPM, Working Memory Training

ACRM Recommendations for Treatment of Attention Impairments

- <u>Practice Option</u>

  o Computers as adjunct

  o Repeated exposure and practice on computer based tasks without therapy is not recommended

Hierarchy of Attention

From most basic to most complex:

- <u>Focused</u>: Ability to respond to a specific stimulus
- <u>Sustained</u>: Ability to sustain the response over time
- <u>Selective</u>: Ability to maintain the response despite distraction
- <u>Alternating</u>: Ability to alternate between two tasks
- <u>Divided</u>: Ability to maintain focus on two things at the same time.

Attention Process Training

- Structured program of attention training, with 5 tracks reflecting the 5 types of attention
- Subsequent training targets those areas with exercises designed to address the particular attention problems shown by the patient. Start easy and become progressively harder. Bottom up procedure.
- Also room for compensatory strategies
- Internalization and generalization built in.

Time Pressure Management (TPM)

- <u>Identify the Problem</u>: Are two or more things to be done at the same time in which there isn't enough time?

- <u>Preventing Time Pressure</u>: Make a plan to deal with time pressure before the task starts

- <u>Handling Time Pressure</u>: Make an emergency plan for anything unexpected

- <u>Executing the Plan</u>

- <u>Monitoring Task Performance</u>

General Strategies to Enhance Attention Training

- Education about types of attention
- Identify internal and external distractions and manage them
- Stop-Think-Plan or Goal-Plan-Do-Review
- Monitor attention lapses and successes
- Use Time Pressure Management when needed

Specific Techniques For Therapists to Use in Interactions

- Ensure you have their attention before proceeding

- Minimize distractions

- Cue that what you are saying is important and they need to listen

- Keep instructions simple and direct

- Speak slowly. Provide extra time

- Provide a quiet area for work that is difficult

- Warn before changing an activity

COMPREHENSIVE PROGRAMS:

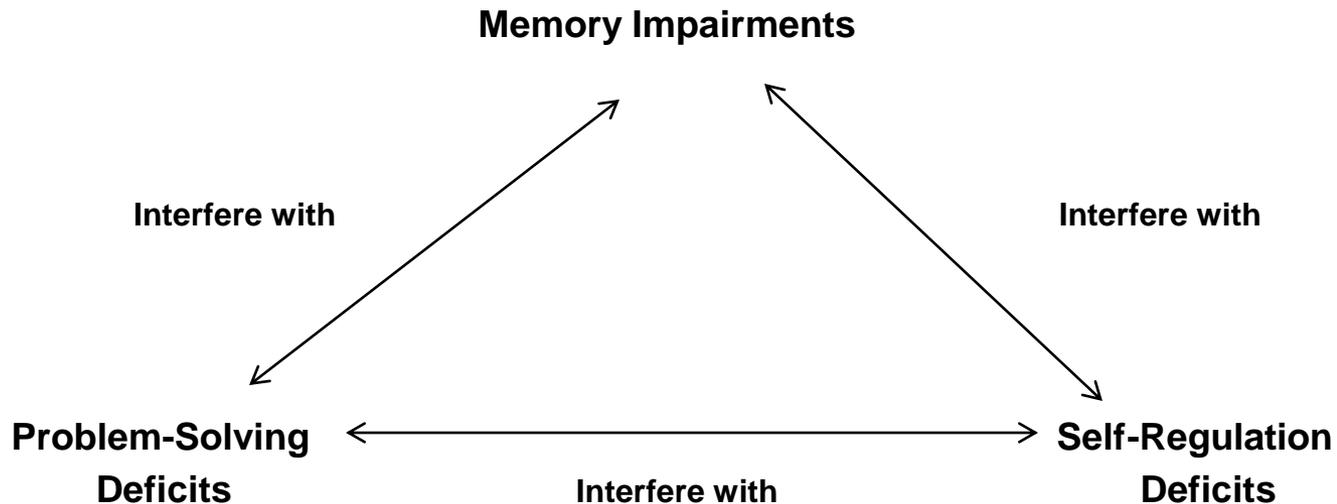## Coordinating Strategies Across Cognitive Domains

ACRM Recommended Features of BI Rehabilitation Programs

- Holistic
- Interdisciplinary
- Evidence-based
- Multimodal

First Feature: Holistic

- Brain injury patients have multiple deficits and disabilities, all of which need to be addressed.

- These include multiple physical impairments

- They also include impairments in memory, attention, executive functioning, visuospatial abilities, motor functions, sensory functions.

- Also often include neurobehavioral deficits, emotional disturbance, personality disorders, substance abuse issues, etc.

Need for Coordinated Care: Symptom Interference in Rehabilitation

Memory Impairments

Interfere with

Interfere with

Problem-Solving Deficits

Interfere with

Self-Regulation Deficits

- **All of these brain-injury related deficits tend to interfere with each other and, as a result, all of them need to be addressed simultaneously, in a holistic program.**

Second Feature: Interdisciplinary Treatment Team

- If treatment success requires working on multiple deficits at the same time, then multiple therapists are needed: OT, PT, ST, and Neuropsychology.

- Using multiple therapists requires a tight coordination of efforts. All therapists must take the same approach, teaching the same compensatory strategies, with the same methods, using the same terminology.

Interdisciplinary Treatment, cont'd

- Strategies are often taught in one therapy session or setting and implemented in another.

- For example, ST may teach a structured problem-solving strategy (GPDR) and OT may use it to work on medications, cooking, etc.

- OT may teach a memory strategy to a patient and PT may use it to help with training wheel chair transfers.

Interdisciplinary Goal Writing

- Goals need to be coordinated among different therapists working with the patient

- Should also incorporate varied approaches to rehabilitation with multiple frameworks and models.

Third Feature:
Evidence-Based Strategies

- All treatment needs to be evidence-based, i.e., based on empirical scientific research. This is reflected in the ACRM recommendations.

- For each cognitive area, the ACRM manual developed protocols to address deficits in BI.

Evidence-Based Goal Writing

- Collaborative between patient and therapist must be strong

- Goals should be clear with a definite objective and time frame

- Goals should be realistic, reflecting a balance between the patient's desires and their dysfunction.

- Short term goals need to include strategies that are effective.
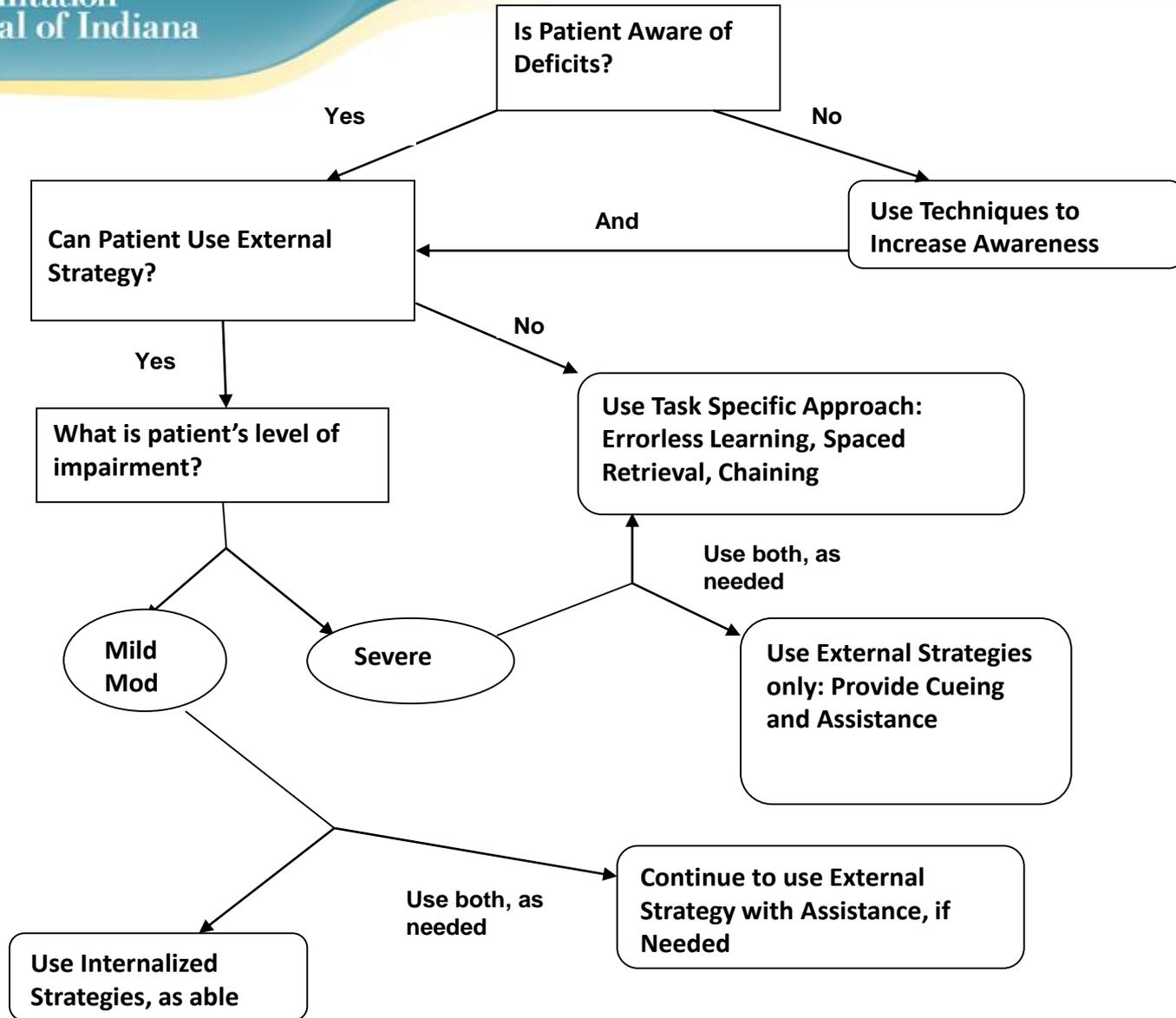
Short Term and Long Term Goals

- Goals are divided into strategic, long-term and tactical, short-term

- Long term: The general approach taken to the deficit; reflects hoped-for outcome

- Short term: The specific means by which the strategy is implemented

- Both are necessary and important

Comprehensive Template for Goal Writing

Five Essential Factors	Example "Patient will perform….
Type of Task	household tasks that require scheduling
Complexity of Task	that are simple
Level of Cueing or Assistance Needed	with minimal assistance
Type of Strategy Employed	using a memory notebook strategy
Measurement of Performance (e,g., speed, accuracy)	at 100% accuracy."

Patient Example of Coordinated Strategic and Tactical Goals

- LT (Strategic) Goal: "Initiate problem solving protocol to improve ability to independently perform household ADLs."

- ST (Tactical) Goal: "Patient will use Goal-Plan-Do-Review strategy to organize complex bill-paying, with minimal assistance and 90% accuracy."

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Is Patient Aware of Deficits?

Yes → Can Patient Use External Strategy?

No → Use Techniques to Increase Awareness

And → Can Patient Use External Strategy?

Can Patient Use External Strategy?
- Yes → What is patient's level of impairment?
- No → Use Task Specific Approach: Errorless Learning, Spaced Retrieval, Chaining

What is patient's level of impairment?
- Mild Mod
- Severe

Severe → Use both, as needed → Use Task Specific Approach: Errorless Learning, Spaced Retrieval, Chaining

Severe → Use External Strategies only: Provide Cueing and Assistance

Mild Mod → Use Internalized Strategies, as able

Mild Mod → Use both, as needed → Continue to use External Strategy with Assistance, if Needed

Stages in Cognitive Rehabilitation

- Acquisition (Learn the strategy)
    - o Patient recognizes and accept their deficits and the potential benefits of treatment
    - o Patient learn the purpose and procedures of treatment strategy
- Application (Apply strategy in clinic)
    - o Improve effectiveness and independence in compensating for deficits
    - o Promote internalization of strategy

Stages in Cognitive Rehabilitation, cont'd

- Adaptation (Apply in the community)
  - o Promote transfer of training to tasks including those that are less structured, more novel, more complex and or/distracting
  - o Promote generalization of skills from structured treatment setting to less structured environments

Monitoring Progress Toward Goals: When Problems Occur

- Ultimate success is measured by patients going back to the activities they value.

- But progress must be monitored. If there are problems, must explore why and ask:

  o Are the strategies realistic, comprehensive, coordinated?

  o Are the tactics effective in implementing the strategy?

Fourth Feature: Multimodal Treatment

- Therapy is most effective when it makes use of a variety of treatment delivery methods.

- These include:

  - A variety of therapy formats, including both individual and group therapies

  - A variety of treatment settings, including the clinic, the community (e.g., on outings), and home (e.g., facilitated by family members).

Benefits of Group Therapy

- Facilitates a sense of belonging and the understanding that everyone shares similar problems.

- Provides an opportunity to help others.

- Helps contribute to a "therapeutic milieu" which can increase interpersonal support and enhance treatment progress.

- Facilitates feedback from peers which is often more easily accepted by patients than feedback from therapists.

- Is less expensive. Enables more sessions under insurance funding caps.

Benefits of a Variety of Treatment Settings

- Fosters generalization of training.

- The cognitive deficits of BI patients often make it difficult for them to see how skills learned in the clinic are applicable to situations in the community.

- Outings and homework assignments help them to apply those skills in a wider range of settings and thereby enhances their ability to use them in the real world.

Neurobehavioral and Psychosocial Factors that influence Outcome

- Patient preinjury variables: coping skills, confidence, values and priorities

- Pre-injury psychiatric problems

- Self-awareness of deficits

- Severity and range of impairment

- Emotional reactions

- Family factors

References

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- Haskins E., Cicerone K., Dams-O'Connor K., Eberle R., Langenbahn D., Shapiro-Rosenbaum A., and Trexler L. (2012) <u>Cognitive Rehabilitation Manual: Translating Evidence-Based Recommendations into Practice</u>. American Congress of Rehabilitation Medicine: Reston, Virginia.