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by

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**Community Integration after TBI Post-Acute Rehabilitation: A Review**

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**Community Integration after TBI Post-Acute Rehabilitation: A Review**

**by**

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**Report**

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## **Dedication**

The following report is dedicated to those who have experienced a traumatic brain injury and are working to restore their life. I have been inspired by patients with TBI that I have had the opportunity to work with during my graduate education and have gained a passion for working with this population after graduation. I would also like to dedicate this to my family and fiancé who have supported me throughout my undergraduate and graduate education. I appreciate the support they have provided and the sacrifices they have made within these past six years.

## **Acknowledgements**

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## **Abstract**

### **Community Integration after TBI Post-Acute Rehabilitation: A Review**

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Traumatic brain injury (TBI), also referred to as an acquired brain injury, is caused by damage to the brain as a result of trauma to the head. The following report serves as a resource for patients and families wanting to gain information regarding community integration outcomes after participation in post-acute rehabilitation programs. The goal of the post-acute level of medical care is to increase functionality and serve as a transition for the patient from the rehabilitation facility to life within the community. A thorough examination of community integration after participation in a post-acute rehabilitative program with the use of the Community Integration Questionnaire (CIQ) is provided. After investigation of the available literature, four articles were found to meet inclusion criteria and were included within the review. All studies included met the following criteria. Participants were ages 17 to 65 years old, had a diagnosis of moderate to severe TBI, were enrolled in post-acute rehabilitation, and were assessed with the *Community Integration Questionnaire* (CIQ). Overall, the available literature suggests

that completion of a program within a post-acute facility does create positive outcomes for the individual with TBI; however, the outcomes are dependent on various factors regarding TBI severity, the administration of intervention, the type of intervention, time post-onset and age of participants at the time of onset. Future research is necessary to provide a more comprehensive view of post-acute rehabilitation and the outcomes that these patients may expect as they begin their road to recovery.

## Table of Contents

List of Tables .....	ix
Introduction.....	1
Levels of Care .....	3
Funding .....	6
Methods.....	8
Description of CIQ.....	8
Literature Review.....	11
Conclusion .....	23
References.....	28

## **List of Tables**

Table 1:	Traumatic Brain Injury Severity Levels .....	2
Table 2:	Total CIQ pre and post test scores .....	13
Table 3:	Mean scores of the CIQ and related subtests .....	18
Table 4:	Mean values included in cluster analysis.....	20
Table 5:	Mean scores for all subtests of the CIQ .....	20
Table 6:	Comparison of variables of TBI populations across studies.....	22

## **Introduction**

Traumatic brain injury (TBI), also referred to as an acquired brain injury, is caused by damage to the brain as a result of trauma to the head. Communication deficits such as impairments of comprehension, spoken and written language, pragmatics, attention, memory, and problem-solving are often present after such an incident. Because loss of communication skills affects 1.5 to 2 million individuals each year, 270,000 of them presenting with a moderate to severe injury, TBI is often referred to as the “Silent Epidemic” (TBI Causes and Number, 2010). The high incidence may cost as much as \$48 to \$60 billion annually. TBI can occur at any age, but the American Speech-Language-Hearing Association (ASHA) reports a higher incidence for individuals between the ages of 15-25 and for adults over the age of 65. Similarly, the incidence is higher for males than females. TBI can result from a variety of causes, such as injuries in contact sports, injuries associated with drug and alcohol abuse, and falls (common with elderly population). The most common cause however, is vehicular accidents (TBI Causes and Number, 2010).

Severity levels of TBI range from mild to moderate to severe and are determined by the amount of damage to the brain. The Agency for Healthcare Research and Quality (AHRQ) (2010) provided a process to categorize the severity level for TBI. The following measures are included in the process: “structural imaging, duration of loss of consciousness (LOS), duration of altered consciousness (AOC), duration of post-traumatic amnesia (PTA), the *Glasgow Come Scale* (GCS) score or the *Abbreviated*

*Injury Severity Scale (AIS) score*” (“Background: The Condition,” 2010, para. 2). Table 1 provided by the AHRQ depicts the components of TBI severity.

<b>Table 1: Traumatic Brain Injury Severity Levels</b>			
<b>Criteria</b>	<b>Mild</b>	<b>Moderate</b>	<b>Severe</b>
Structural Imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of Consciousness (LOC)	< 30 minutes	30 minutes to 24 hours	>24 hours
Alteration of Consciousness/Mental State (AOC)*	A moment to 24 hours	>24 hours	
Post-traumatic Amnesia (PTA)	0-1 day	>1 and <7 days	>7 days
<i>Glasgow Coma Scale (GCS)</i> (best available score in 24 hours)	13-15	9-12	3-8
<i>Abbreviated Injury Severity Scale (AIS)</i>	1-2	3	4-6

*Note.* Reprinted from “Background: The condition,” by the Agency for Healthcare Research and Quality, 2010.

The differences in mild TBI as compared to moderate and severe are included in Table 1 above. Due to differences in prognosis, complications, and intervention approaches when managing mild TBI, only severity ratings of moderate-severe are targeted for the literature review (“Background: The Condition,” 2010).

## **LEVELS OF CARE**

Damage to the brain results in multiple medical complications which are often life threatening and require a continuum of care. The first level of care involves the emergency medical personnel (EMT, paramedics, emergency room physicians and nurses) who work to stabilize the patient and prevent any additional damage. The initial level of care can involve providing the patient with oxygen, performing CPR, ensuring the patient's airway is opened, and monitoring and controlling blood flow and pressure ("Background: The Condition," 2010). Additional measures may be necessary depending on the condition of the patient. A series of assessments and examinations to determine the extent of the injury are undertaken once the patient is stabilized. The *Glasgow Coma Scale* is a measure medical personnel use to determine the patient's state of consciousness and function ("Background: The Condition," 2010). Computed tomography (CT) and Magnetic Resonance imaging (MRI) scans are performed on patients with moderate to severe injuries and in some cases, mild injuries. The scans are used to determine the changes within the individual's brain as a result of the incident (National Institute of Neurological Disorders and Strokes, 2002).

After the patient is stabilized and starting to recover (acute phase), the individual is transferred to a post-acute rehabilitation facility. Within the facility, the patient works to regain function in various areas such as mobility, communication and activities of daily living (dressing, feeding etc.). Services provided often include physical therapy (PT), occupational therapy (OT), speech-language therapy (ST) and neuropsychology

(NP). Additional services may be provided depending on the specific facility and patient needs.

This report serves as a resource with a focus on post-acute rehabilitation facilities, where the emphasis of therapy is to improve the patient's quality of life and decrease the level of dependency and handicap (Sander, Caroselli, High, Becker, Neese & Scheibel, 2002). The goal of the post-acute level of medical care is to increase functionality and serve as a transition for the patient from the rehabilitation facility to life in the community. The literature reviewed in this report was limited to patients enrolled in post-acute rehabilitation programs in order to compare various outcomes of community integration among TBI sample populations. Post-acute facilities are being developed at a rapid rate. Therefore, it is important to determine the effectiveness of such rehabilitative programs because, currently, there is limited research regarding community integration.

Sander et al., (2002) address the problems that may result after a traumatic brain injury such as deficits in financial independence, inability to hold a job, decreased ability to interact and communicate socially, and decreased ability to parent children. One comprehensive post-acute rehabilitation facility, the Transitional Learning Center (TLC) in Galveston, Texas, explains that their mission is to provide a rehabilitation program to individuals who have experienced a TBI. TLC works to provide the best and most efficient services in order to improve the patients' quality of life and restore the greatest amount of functional independence (Transitional Learning Center, 2010). Comprehensive post-acute care programs like this offer a range of services (i.e. PT, OT, ST NP, etc.) in

both individual and group settings. The frequency of services provided is dependent on the individual patient, the severity, and areas of need (i.e. some patients receive speech therapy twice/day while others require speech services two times/week). Post-acute rehabilitation facilities may offer both inpatient and outpatient services. Length of stay within the facility is dependent on available funding for the patient. A patient's length of stay may range from six weeks to nine months with the average length of stay between six and nine months (Brain Injury Association of America, 2011).

Individuals with TBI have different needs and motivations when working to restore quality of life. Therefore, it is necessary to provide the patient or caregiver with information to assist in the selection of the most appropriate rehabilitation program. These decisions are often driven by consumer expectations, but the variables that influence goal-achievement are quite complex. This complexity prompts the following questions: What type of community integration outcomes can be expected after completing a post-acute care program? What needs to be considered when choosing the best program? Which patients benefit from post-acute rehabilitative programs in terms of community integration? Which therapy strategies are most beneficial? Because funding constraints often limit length of stay in a facility, it is critical to determine which individuals experience positive benefits, so that we can improve the quality and cost-effectiveness of comprehensive post-acute rehabilitation programs. Currently, no systematic reviews have been conducted regarding the effectiveness of post-acute rehabilitation services ("Background: The Condition," 2010). A lack of evidence,

specifically with randomized control studies exists in the area. Determining the most successful way to approach therapy can improve the quality of life for individuals who with TBI as they re-enter the community. It is important to know what is available for the patients and specifically what will be most beneficial. The decision regarding the appropriate program must take into the account the patients' environment and the available funding.

## **FUNDING**

In terms of current funding, a poll conducted by the American Speech & Hearing Association (ASHA) addressed the adequacy of insurance coverage for individuals with TBI between the ages of 18-64 and their road to recovery. The poll targeted ASHA certified speech-language pathologists (SLP) who work in rehabilitative settings with patients with TBIs. Typically, the responsibility of the SLP within the setting is to focus on areas of cognition including, reasoning, memory, orientation, spoken language, executive functioning, formation of language, etc. The ASHA poll concluded that insurance coverage is inadequate for TBI patients working toward recovery.

Approximately 65% of the SLPs reported that lack of funding prevented “optimal recovery” for individuals with TBI (ASHA Poll: Inadequate, 2007, para. 1). The SLPs expressed a level of “dissatisfaction” with their ability to provide services, largely due to the lack of funding from insurance. Approximately 33% of those polled reported that about half of the individuals they saw were denied coverage in some area of services, and of those who were denied coverage, only 10% were successful after taking measures to

appeal the denial. Frequently, insurance coverage provides minimal to no funding for rehabilitation services in the area of cognition. This poses a problem because ASHA has provided evidence reporting that individuals who were able to receive “early intervention” cognitive therapy services demonstrated higher levels of cognitive functioning at the time of discharge from hospitals or community facilities (ASHA Poll: Inadequate, 2007).

## **Methods**

The literature review includes data obtained through the electronic databases of *Google Scholar* and *EBSCOhost* using the following keywords: *traumatic brain injury, CIQ and rehabilitation*. All studies included in the review met the following inclusion criteria. Participants were ages 17 to 65 years old, had a diagnosis of moderate to severe TBI, were enrolled in post-acute rehabilitation, and were assessed with the *Community Integration Questionnaire (CIQ)*. Only research published after the year 2000 was included to eliminate literature that may no longer be applicable. Exclusion criteria included literature addressing mild TBI, acute care facilities, studies that used integration measures other than the CIQ, and articles dated before the year 2000.

### **DESCRIPTION OF CIQ**

The CIQ is an objective assessment that measures community integration for individuals with TBI. It is one of the most commonly used and studied instruments. The recent scoring revisions and the ability to administer in Spanish and English contribute to the strength and popularity of the measure. Reistetter and Abreu (2005) report that 5.3 million Americans with TBI are living within the community; therefore, there is a need to measure the level of community integration. Barry Willer, Ph.D., and colleagues, created the questionnaire to objectively assess community integration within 3 domains: the home (i.e. preparing meals, parenting), social life (i.e. leisure activities, interacting with friends) and productivity level (i.e. part-time or full time employment, schooling, and volunteer work) (Zhang, Abreu, Gonzalez, Seale, Masel, and Ottenbacher, 2002). The

CIQ is brief, consisting of 15 components and takes approximately 15 minutes to complete. Moreover, the CIQ targets behaviors (excludes emotions/feelings), can be completed in-person or by telephone, can be administered to the individual (person with TBI) or someone with close knowledge of patient's functionality, has a lack of biases (age, gender, socioeconomic status) and sensitivity to wide array of living conditions (Wilier, Ottenbacher & Coad, 1994). One overall score (0-29) is obtained, which is comprised of three individual scores (home (0-10), social integration (0-12), and level of productivity (0-7)) (Dijkers, 2000). A higher score indicates a greater level of integration.

A systematic review conducted by Reistetter & Abreu (2005) supports the use of the CIQ as a reliable and valid measure. Seventy-two articles were included in Reistetter and Abreu's review, and of the 72 articles, 52 were found to use the CIQ as a measure of community integration. The remaining literature used various other measures (i.e. Craig Handicap Assessment and Reporting Technique (CHART)). The authors of the review concluded the CIQ demonstrated high reliability and validity, though exact levels were not provided. Sensitivity was established as an additional strength of the instrument, specifically in classifying individuals who sustained a TBI when compared to adults who demonstrated other disabilities or were typically functioning (Reistetter & Abreu, 2005).

Zhang, Abreu, Gonzalez, Seale, Masel, and Ottenbacher (2002) conducted an additional study to compare the validity of three assessments often used to determine the outcomes of rehabilitative services. The assessments included the CIQ, CHART, and the Disability Rating Scale (DRS). Overall, the conclusions of the study stated the CIQ

“appears to be the most appropriate instrument in quantifying rehabilitation outcome in patients with TBI at the participatory (handicap) level” (Zhang et al., 2002, para.1). Both the systematic review, conducted by Reistetter & Abreu (2005) and the Zhang et al., (2002) study provide evidence supporting the use of the CIQ within this report as a reliable measure of community integration.

This report serves as a resource for those patients and family members attempting to determine outcomes regarding community integration they may expect after completion of a rehabilitative program. The results reported in the literature may assist individuals working with TBI patients in determining areas that need to be targeted in order to improve the levels of community integration.

## **Literature Review**

In order to gain a general sense of TBI patient outcomes regarding community integration after discharge from a post-acute rehabilitation program, a review of the available research was conducted. Only studies conducted with the CIQ were included to keep a consistent comparison of community integration among various TBI populations. Initially, a total of 12 articles were selected according to keywords included in the database search. After examination of each of the articles selected, it was determined that only 4 of the 12 articles met all inclusion criteria establish for the review of available literature. Eight of the 12 articles were excluded due to the following factors: inclusion of only mild TBI participants, lack of participation of TBI patients in a post-acute rehabilitation facility and exclusion of the CIQ as a measure of community integration within the sample population.

Seale, Caroselli, High Jr., Becker, Neese & Scheibel (2002) conducted a pre-post study with the focus on an area that currently demonstrates limited research, the administration of the CIQ upon admission to the comprehensive post-acute rehabilitation facility, and administration of the instrument post-rehabilitation. The study investigated the differences in scores between pre- and post-intervention. Eighty-seven adults with TBI resulting from a range of causes (vehicular & motorcycle accidents, falls, blunt force trauma) were discharged from an acute setting and granted admission to a post-acute facility. Participants were enrolled in the program for approximately 45 days (Seale et al., 2002). Initially, all 87 were administered the CIQ for the pre assessment (time of

admission) but at the time of post-assessment (time of discharge), 16 participants were unwilling to participate. Before enrolling in the program, all participants resided in a home setting or a nursing facility. Sixty-five participants were identified at patients with severe TBI according to the score obtained on the *Glasgow Coma Scale* (score of 8 or less) and the severity of six participants was not disclosed due to medical records being unavailable (Seale et al., 2002). In order to account for “spontaneous recovery,” the participants were divided into two separate groups, individuals who entered rehabilitation within one-year post trauma (L1Y) and individuals who entered rehabilitation between one and five years post trauma (G1Y 2) (Seale et al., 2002). L1Y presented a mean age of 28.7 years at the time of injury and G1Y with a mean age of 25.6 years. When comparing the overall differences in the two groups, Seale et al., (2002) reported that L1Y demonstrated a larger percentage of individuals who received psychiatric intervention prior to injury and engaged in the abuse of drugs and alcohol. G1Y had an overall lower *Glasgow Coma Scale* score (1 point), had a mean age approximately three years younger, and received about one year less in regards to education (Seale et al., 2002).

During the time of intervention, patients received a variety of services (i.e. PT, OT, ST, NP, therapeutic recreation (TR), etc.) targeting the patient’s specific needs. The mean length of the program for both groups was approximately 71 days (Seale et al., 2002). A staff member within the facility administered the CIQ pre- and post-rehabilitation. The staff member who conducted the initial assessment did not conduct the final assessment. The initial assessment was administered in a face-to-face interview

format the day of admission to the facility, and the final assessment was administered over the phone approximately one month post-discharge date with a mean of 47 days for L1Y and 38 days for G1Y.

The overall results of the study yielded scores for both groups that demonstrated improvements in community integration (Seale et al., 2002). The mean total scores on the CIQ for LIY and G1Y pre and post intervention are provided below.

**Table 2. Total CIQ pre and post test scores**

	<b>L1Y</b>	<b>G1Y</b>
Initial Assessment (Admission)	11.6	12.3
Final Assessment (Post-discharge)	16.3	14.6

L1Y demonstrated more significant improvements though the authors believe significance may be attributed to “spontaneous recovery” (Seale et al., 2002). The L1Y presented with 59.4% of individuals who showed improvements in overall community integration and the G1Y showed improvements with 35.9% of individuals. However, in reference to the social integration portion, 79.5% of the total participants demonstrated no improvements, and authors believe an explanation may be due to the greater length of time post-onset. The participants included within the 79.5% may not have been provided with opportunities to increase functioning within the community due to limitations of social interactions and activities. In the conclusion, the examiners suggested further

investigation of individual variables that may influence change in community integration (Seale et al., 2002).

Colantonio, Ratcliff, Chase, Kelsey, Escobar and Vernich (2004) conducted a study to investigate the long-term effects of TBI and the outcomes seen after participation in comprehensive rehabilitation located in Pennsylvania. All participants were discharged from the in-patient facility between the years of 1973 to 1989 and presented with a severity rating of moderate to severe, though the majority of the sample presented with severe TBI. Patients were contacted after thorough review of medical records in order to determine that inclusion criteria were met. Six-hundred eligible individuals were identified and contacted, and of the 600, 290 were unavailable to participate due to location, unwillingness, or death. All willing individuals scheduled an initial interview in person or by phone. Twenty-two were unable to complete the interview due to deficits (i.e. cognition). Therefore, an “informant” participated in the interview to provide data. The sample of participants was 69.9% male. The demographics of the sample included a mean age of 29.9 years at the time of onset and a mean of 12 years of education. Only 4% of the sample population was identified as “non-white” with the large proportion of the 4% African-American. Cause of injury was reported to be vehicular accidents for 74.8% of the sample and 10.1% resulted from falls (Colantonio et al., 2004). The average time for follow-up of patients previously admitted to the facility was 14.2 years. At the time of follow-up Colantonio et al., (2004) report that approximately 4-6% of individuals required assistance with daily activities and 88% demonstrated independence with daily

activities (dressing, bathing, eating, toileting and use of the telephone). In terms of education and employment at the time of onset, 22.6% identified themselves as full-time students, 77.1% of the individuals were employed and of the percentage, 64% possessed full-time employment. At the time of the follow-up study, 5.6% identified themselves as students and only 39.9% of the individuals were working. Examiners reported 29.1% possessed full-time employment and 11% were retired.

The CIQ was administered to participants and yielded an overall score of 16.5 out of 28 possible points. The subtest regarding social integration yielded a mean score of 7.9. The productivity portion demonstrated a mean of 3.6 and the home integration portion had a mean of 4.8. Colantonio et al., (2004) reported the social subtest demonstrated the highest level integration and the home portion with a score of 4.8 represented a significantly low level of home integration. Approximately 67.6% of respondents stated they received some form of therapy (OT, PT, ST) after discharge from the post-acute rehabilitation facility that may have influenced the level of productivity or integration between the time of discharge and follow-up. Overall, the examiners report the scores obtained from the CIQ representative of results similar to those that have been found in additional studies conducted with TBI patients, but significantly lower than studies conducted with typical individuals. Results however, demonstrated lower scores than those found with TBI individuals who live independent lives within the community, which is an area of concern for the investigators (Colantonio et al., 2004).

Cicerone, Mott, Azulay, and Friel (2004), examined the level of community integration with the comparison of two groups of participants, those enrolled in an “intensive cognitive rehabilitation program” (ICRP) and those enrolled in a “standard neurorehabilitation” (SRP) program. Both programs were post-acute comprehensive rehabilitation programs. In order for admission into the programs, the following criteria was established: medical stability, independence in feeding and toileting, possessing cognitive skills to receive therapy, TBI, 18 years or older, English speaking, and lacking significant language or comprehension deficits (Cicerone, 2004). Criteria also required that each participant have a family member or care provider able to participate in planning and execution of intervention. The study included 56 individuals, with 89% identified as moderate to severe TBI. All participants were enrolled in rehabilitation within 2 years of the date of injury. Twenty-seven patients were assigned to the ICRP group and this group demonstrated significant deficits in cognition. Twenty-nine patients were admitted to the SRP group. Individuals assigned to the SRP group demonstrated a shorter period of time between injury and admission to the program with 97% with one year or less and of this percentage, 69% were within three months post time of injury. ICRP members ranged from four months to one year post injury. Examiners report that the majority of individuals within both groups held full-time employment prior to injury.

ICRP intervention lasted approximately 16 weeks (four days/week for five hours/day) and consisted of individual and small group intervention. Targets of intervention were based on the needs of the individual but included areas such as

pragmatics, psychotherapy, caregiver support, TR, OT, PT and vocational support. Cognitive therapy was administered within a group setting three of the four days per week. In comparison, the SRP was considered to be “less intensive” and was conducted for 15 hours per week, but as intervention continued, based on the needs of the patient, the amount of time may have increased or decreased. SRP therapy consisted of OT, PT, recreational and vocational therapy, and NP. Services were adjusted according to the patient’s deficits. Examiners report that overall, each intervention program continued for 4 months.

In order to compare the efficacy of the intervention programs regarding community integration, the CIQ was administered prior to treatment and post-treatment. The results of the CIQ were taken from the literature and the mean scores are provided within the following table.

**Table 3. Mean scores of the CIQ and related subtests.**

	ICRP Group		SRP Group	
	Pre-Treatment	Post-Treatment	Pre-Treatment	Post-Treatment
<b>Total CIQ Score (0-29)</b>	11.6	16.8	13.7	16.1
<b>Home integration score (0-10)</b>	3.1	5.1	3.5	4.5
<b>Social integration score (0-12)</b>	7.0	8.6	6.8	8.0
<b>Productivity score (0-7)</b>	1.4	3.1	3.4	3.6

Overall, improvements with mean scores are seen within all areas for both groups, though Cicerone et al., (2004) report that 52% of the ICRP individuals demonstrated increased scores that were statistically significant as compared to the SRP group, only 31% demonstrated a statistical significance. Of the total participants included within the SRP, 7% of individuals demonstrated a decline in overall score and this decline was not seen within the ICRP (Cicerone et al., 2004). In conclusion, examiners discovered that the ICRP, intensive program presented more favorable outcomes in regards to improvement in community integration which highlights the importance of the comprehensive, intensive post-acute program.

The following study was conducted by Doig, Fleming & Tooth (2001) to measure the degree of community integration 2-5 years post injury for TBI patients who received treatment in a rehabilitation facility in Brisbane, Australia between 1991 and 1995. The sample population included 208 patients (168 men and 40 women). The average age of the sample at the time of the investigation was 35.8 years with a mean of 10.9 years for education. The average score on the *Glasgow Coma Scale* was 6.9 and the average period of time for post-traumatic amnesia was 43.9 days resulting in a mean severity rating of severe TBI (Doig et al., 2001). At the follow-up, the mean length of time post-injury was reported to be 3.5 years. The literature provided no additional information regarding the services administered within the rehabilitation program.

The CIQ was sent to all participants via mail, and 209 questionnaires were completed by the TBI patient or care-provider. In order to conduct an analysis of the results of the questionnaires, the examiners developed three “clusters” to group participants who were similar to one another in terms of demographics and injury variables (age, education, GCS, length of acute stay, Disability Rating Scale). The data for each of the three subgroups was taken from the literature and is provided in the following table.

**Table 4. Mean values included in cluster analysis**

<b>Mean Values</b>	<b>Cluster 1</b>	<b>Cluster 2</b>	<b>Cluster 3</b>
<b>Age</b>	32.59	35.61	39.09
<b>Disability Rating Scale</b>	5.34	4.51	6.67
<b>Length of stay in acute care</b>	37.32	31.98	51.17
<b>Education</b>	11.14	11.11	10.50
<b>Glasgow Coma Scale</b>	7.28	7.92	6.17

The first cluster included 78 participants and was referred to as the “working group. Cluster two included 46 participants and was referred to as “the balanced group” and cluster three, “the poorly integrated group” included 84 participants (Doig et al., 2001). Examiners report that overall, 38% of the total sample population demonstrated a high score in productivity, but the community integration of the sample was considered to be poor. The mean scores for each of the subtests within each cluster are provided in the table below.

**Table 5. Mean scores for all subtests of the CIQ**

<b>CIQ mean values</b>	<b>Cluster 1</b>	<b>Cluster 2</b>	<b>Cluster 3</b>
<b>Home integration (0-10)</b>	3.6	8.98	3.28
<b>Social integration (0-12)</b>	8.07	10.22	5.90
<b>Productivity (0-7)</b>	5.58	4.67	1.67

The results of the CIQ demonstrate overall, that cluster 3 yielded the lowest scores across subtests after participation within a rehabilitation facility. Within this subgroup, all areas of integration were found to be low and examiners believe the results are attributed to the fact that the individuals included within the group demonstrated higher levels of severity and longer lengths of stay within acute care facilities (Doig et al., 2001) The significant differences in scores between the third cluster and clusters 1 and 2 is important because it demonstrates that patients identified with higher severity rating are in great need of services due to lower levels of community integration. The results highlight the importance of quality of care and services provided within rehabilitation facilities when working with patients who demonstrate severe TBI.

Provided on the following page is a matrix including the data from each of the studies previously discussed. This matrix serves as a resource to more closely compare the results of each of the studies regarding community integration after participation in a post-acute rehabilitation program.

**Table 6: Comparison of variables of TBI populations across studies**

	<b>1) Seale, Caroselli, High, Becker, Neese &amp; Scheibel (2002)</b>	<b>2) Colantonio, Ratcliff, Chase, Kelsey, Escobar &amp; Vernich (2004)</b>	<b>3) Cicerone, Mott, Azulay &amp; Friel (2004)</b>	<b>4) Doig, Fleming &amp; Tooth (2001)</b>
<b>Location</b>	N/A	Pennsylvania	N/A	Brisbane, Australia
<b>Sample Size</b>	87	310	56	208
<b>Mean age at time of injury (years)</b>	L1Y: 28.7 G1Y: 25.6	29.9	ICRP: 37.8 SRP : 37.1	32.3
<b>Average length of time post-onset</b>	L1Y: 7 months G1Y: 29 months	14.2 years	ICRP: 33.9 months SRP : 4.8 months	3.5 years
<b>Severity</b>	65 participants = severe 6 participants = unknown	Moderate to severe	89 % Moderate to Severe	Severe
<b>Intervention Description</b>	approx. 71 days Received PT, OT, ST, NP, TR services	N/A	<b>ICRP:</b> intensive, 4 days/week, 5 hours/day for 16 weeks <b>SRP:</b> 15 hours/week	N/A
<b>Total CIQ Score (mean) (0-29)</b>	<b>L1Y:</b> Pre =11.6 Post = 16.3 <b>G1Y:</b> Pre = 12.3 Post = 14.6	16.5	<b>ICRP:</b> Pre =11.6 Post = 16.8 <b>SRP:</b> Pre = 13.7 Post = 16.1	N/A
<b>CIQ: Home Integration Score (mean) (0-10)</b>	<b>L1Y:</b> Pre =2.7 Post = 4.4 <b>G1Y:</b> Pre = 2.9 Post = 3.8	4.8	<b>ICRP:</b> Pre =3.1 Post = 5.1 <b>SRP:</b> Pre = 3.5 Post = 4.5	<b>Cluster 1:</b> 3.6 <b>Cluster 2:</b> 8.98 <b>Cluster 3:</b> 3.28
<b>CIQ: Social Integration Score (mean) (0-12)</b>	<b>L1Y:</b> Pre = 7.1 Post = 8.3 <b>G1Y:</b> Pre = 7.4 Post = 8.1	7.9	<b>ICRP:</b> Pre =7.0 Post = 8.6 <b>SRP:</b> Pre = 6.8 Post = 8.0	<b>Cluster 1:</b> 8.07 <b>Cluster 2:</b> 10.22 <b>Cluster 3:</b> 5.90
<b>CIQ: Productivity Score (mean) (0-9)</b>	<b>L1Y:</b> Pre =1.8 Post = 3.6 <b>G1Y:</b> Pre = 2.0 Post = 2.7	3.6	<b>ICRP:</b> Pre =1.4 Post = 3.1 <b>SRP:</b> Pre = 3.4 Post = 3.6	<b>Cluster 1:</b> 5.58 <b>Cluster 2:</b> 4.67 <b>Cluster 3:</b> 1.67

## **Conclusion**

The examination of the available literature regarding community integration after participation in a post-acute rehabilitation program demonstrated that evidence is limited in regard to the particular area of research. Literature that accurately fits the established inclusion criteria was difficult to find due to differences in participant characteristics, treatment setting, and measures of community reintegration. The limitations in evidence demonstrate a need for future research to further examine the effectiveness of post-acute programs when targeting community integration. As post-acute facilities develop, it is important to determine the factors that may contribute to the TBI patient's ability to leave the rehab facility and successfully re-enter the community. Overall, the available literature suggests that completion of a program within a post-acute facility does create positive outcomes for the individual with TBI; however, as demonstrated within the matrix, the outcomes are dependent on various factors regarding TBI severity, the administration of intervention, the type of intervention, time post-onset and age of participants at the time of onset. Another factor not included in studies, but one that must be taken into account, is the funding available to the patient. The finding that most SLPs report they are unable to administer adequate therapy due to lack of insurance coverage (ASHA Poll: Inadequate, 2007), demonstrates an issue that must be addressed in order to provide individuals who sustain TBI with the most complete and immediate services. As stated within the results of the poll, it is essential to provide patients with intervention as close to time of onset as possible in order to achieve maximal recovery, specifically in the

area of cognition. If individuals with TBI do not receive adequate financial support and are unable to enroll in post-acute programs, the loss of functionality and deficits in community integration seen within the sample populations will continue to be seen with TBI populations in the community.

According to Cicerone et al., (2004), the intensive approach to intervention appears to be most beneficial when comparing overall improvements in CIQ scores. All four articles included demonstrate a mean age between 25-40 years of age at the time of onset; therefore, it is important to examine the results of the CIQ with older populations at the time of onset in order to generalize results beyond the ages that are included within these four studies. It was seen by Seale et al., (2002) that the time in which intervention is administered is significant in terms of outcomes when working to improve integration scores. Examiners report that participants included within the LIY group (7 months post-onset) showed greater improvements in overall CIQ scores when compared to the overall mean score of the G1Y group. This evidence further supports the importance of administering treatment as soon as possible after the time of injury in order to receive the most gains. The results of the Doig et al., (2001) article reveal that overall, cluster 3 resulted in the lowest scores in all categories (home, social, productivity). The examiners attribute this finding to the fact that those included within the cluster presented with more severe TBI and required a longer period of time within the acute-care phase. Therefore, the severity rating is a significant factor when examining the expected outcomes.

Though two of the four studies were able to provide measures of improvement, the sample sizes are smaller than ideal, which hinders the ability to generalize the results to other populations. The Colantano et al., (2004) and Doig (2001) literature provides data regarding the sample population and measures of the levels of integration, but does not provide information regarding the specific intervention administered. Pre-post assessment methods were not included which prevents the investigator from replicating the method and gaining information regarding improvements over time. The single scores provided must be compared with the scores from the other studies to determine where the patients measure in integration as compared to various populations. The lack of comparison scores prevents examiners from determining whether the post-acute program was truly beneficial to the patients or if scores were influenced by spontaneous recovery.

After completion of the literature review, it is clear that individual factors, such as age at the time on onset, severity of injury, time post onset and method of intervention play a role in the effectiveness of the treatment when determining community integration. Information was lacking within the studies regarding the specific length of stay for participants and frequency of services within the facility, but these factors are also important to consider when examining the differences in outcomes of community integration. Participants who received adequate funding for services may have demonstrated greater improvements in community integration scores though this component was not thoroughly examined. These various factors should be taken into

account when attempting to select the most appropriate facility for the brain injured individual. It is important to consider all available resources.

Future research should be conducted to provide data for professionals working with TBI patients. First, future research should target larger sample sizes ranging from 15-65 years of age. In order to generalize results found within studies and provide prospective patients with adequate information regarding integration after participation in a post-acute facility, it is necessary to expand the sample populations to a wide range of individuals. Second, follow-up with the participants over a period of time will allow researchers to examine maintenance of gains and progress beyond the period of intervention. Follow-up studies should begin with a pre assessment, (prior to any intervention) an assessment halfway through the rehabilitative process and post assessment (post intervention). This progress should continue to be monitored throughout the lifespan of the participant to determine whether the community integration changes are maintained.

Information regarding maintenance of improvements provides researchers with a better understanding of whether the intervention has, in fact, had a positive influence on the participant and whether the treatment was beneficial long-term. Long-term maintenance is essential as the participants leaves the facility and works toward restoration of life.

Lastly, comparisons of scores across facilities can give a broader picture of post-acute facilities that have been found to have greater benefits and compare the methods of

treatment which will benefit potential clients as they select treatment facilities that best fit the individual. Overall, the additional research will help professionals working in post-acute facilities to make the necessary changes and improvements in order to increase the quality of services available to those individuals who have sustained a TBI. Future research will also provide a more comprehensive view of post-acute rehabilitation and the outcomes that these patients may expect as they begin their road to recovery.

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