

# Uses of an Empirically Derived Client Typology Based on Level of Functioning: Twelve Years of the CCAR

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## Abstract

*The Colorado Client Assessment Record (CCAR) is a problem checklist and level of functioning rating instrument used to describe admissions to a public mental health system. A brief, non-technical summary of recent research and administrative applications involving this instrument is presented. A stable factor structure, generalizable to several diverse client populations, is reported. Scaling procedures for measuring these procedures and a client typology based on this scaling are described. The client typology is differentially related to the types of services received and the costs of treatment episodes. The typology is also used to understand differences in case mixes and lengths of stay at two state hospitals.*

Administration of state-level programs for mentally ill persons begins with a clear understanding of the problems and needs of those persons. Such an understanding relies heavily on data and measurement. The Colorado Division of Mental Health (DMH) has a well-established mental health management information system (MIS), receiving data from 17 centers, three specialty clinics, two state hospitals and one general hospital emergency room. Data are organized around three kinds of information: client characteristics, human resources and fiscal. The MIS has supported a system of performance contracting between DMH and Colorado's public mental health centers/clinics for eight years and has provided information supporting budget initiatives, targeting of services, new program development and research and demonstration projects, several of which have been funded by various programs within NIMH. Currently funded programs include service system development (Child-Adolescent Service Systems Program, 1989-91), MIS enhancement (Colorado MHSIP Implementation Program, 1989-92), outcome research (Chronic Mentally Ill (CMI) Client Types and System Reform: An Outcome Study, 1989-93) and research demonstration (Alternative Models for Delivering Rural Crisis Services, 1990-1995).

Large state mental health systems have the potential for accumulating enormous data bases. Often these are suitable for studying client problems and needs. The Colorado DMH has been collecting a standard minimum data set on every client admitted to the public mental health system for the past 12

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years. The records on file now number more than half a million. A file this large permits levels of aggregation which can firmly establish population parameters and relationships. Colorado's admission data set includes a measure of client level of functioning (LOF) and the Colorado Client Assessment Record (CCAR). Current emphasis on LOF is an important development in client information. LOF scores of individuals, viewed from the perspective of a state system, provide valuable knowledge about the kinds of clients in the system, their numbers and their needs. LOF scales can also be useful at the client level. While the initial admission procedures of identifying the client, determining ability to pay and writing a brief description of the presenting problem may be sufficient for many purposes, the systematic screening of a client's functioning is also important. Such screening is likely to discover some mental health dysfunction such as depression, anxiety or thought disorder but may also flag other problems such as substance abuse, antisocial behavior or medical disability. Most formal client assessment tools focus almost exclusively on the mental illness and rarely cover other areas of functioning.<sup>1,2</sup>

A good LOF screening tool would provide profiles, analogous to Minnesota Multiphasic Personality Inventory (MMPI) profiles, of clients as they appear at admission. Client LOF profiles can be grouped according to similarity and the groups organized into a client typology. Client typologies are in fact shorthand devices for using LOF information more efficiently. A typology with a small number of types, say four to 10, lends itself readily to the kinds of simple, quick studies that are responsive to the immediate needs of mental health administrators. Such studies might focus on services received, length of stay and service cost. A client typology, empirically derived from the CCAR, is used with these service measures to study Colorado's service system. The results of three such studies are reported here.

In summary, this paper is about making use of client information. It is intended to benefit mental health administrators, policy-makers, planners and program managers, providing these persons with tools for manipulating client information and the knowledge of how to use them. It is hoped this will ultimately enhance their ability to make better, more well-informed decisions in their respective roles.

## **The Colorado Mental Health Management Information System**

The current system of data collection is built around three data bases: admissions/terminations, open cases and services. Each is described in turn.

### **Admissions/Terminations Data Base**

Every one of the 40,000 clients admitted annually to DMH has an admission form comprising the MHSIP Minimum Data Set (demographics, diagnosis, previous care) and a CCAR completed by the admitting clinician at time of admission. Centers and clinics are required, as part of their performance contracts with the DMH, to provide three kinds of client data: characteristics of admissions/terminations, client services reports and additional reports including an annual open case survey. Since the basis for contracting is an agreed-upon number of annual admissions of specified client types (defined by age, chronicity and severity), especially close attention is paid by the agencies to the timeliness and accuracy of the admission data.

A termination form is completed on every person discharged, whether the discharge was clinical or the client failed to return for further treatment. The form provides type of discharge, LOF ratings and updates on admission variables such as employment and living situation. Current files and 12 years of archived records are maintained on two state computer systems. This data base provided client files for studies of the CCAR reported here.

### **Open Cases Data Base**

DMH conducts a survey of cases open at the centers, clinics and hospitals on the last day of the fiscal year. Data are collected on all clients in modalities other than outpatient; a 10% sample is randomly

drawn from clients who are receiving outpatient care only. Admission variables such as diagnosis, living situation and employment are updated, and a brief problem checklist and LOF ratings are also collected. This survey provides a snapshot of the DMH client population that includes long-stay clients. This group is of particular interest to administrators but is often excluded, by definition, from outcome studies that employ only samples of discharged clients.

### **Services Data Base**

This data base provides client-level data on services and billing. It is created by merging a client CCAR file with a client file containing services and billing data. The latter file is a carefully constructed sample of centers' clients. For a different quarter each year, every center and clinic generates a random sample of "clients served" by combining 2.5% of cases open at the beginning of the quarter with an additional 15% of admissions occurring during the quarter. Units of service rendered to each client in the sample are tallied for either one year or until discharge, whichever comes first. For each client admission episode, units are counted and totaled in five categories: inpatient, residential, partial care, outpatient and case management. The total amount billed and how it is divided among five categories (patient/spouse/family, health insurance, Medicare, Medicaid, and other) is also included. The service and billing data are then forwarded to DMH, where each client record is matched with that client's admission data. Unit costs for each modality are then added to create the final file. Since 95% of admission episodes on this file are complete within one year, it is used to look at episode length and episode cost as well as services and billing data for most clients. This data base provided client files for studies of service utilization and outcome reported here.

## **CCAR — The Instrument**

The Colorado Client Assessment Record (CCAR) is the most important element in the client side of the Colorado MIS. It describes all clients at the time of their admission and termination. CCAR variables are updated annually for a random sample of cases that remain open. Services data on a different sample of clients are matched to CCAR data on those clients for studies of service patterns by type of client.

The CCAR is a problem checklist and multivariable level-of-functioning rating scale instrument, originally designed for description of mental health system clients and outcome evaluation. Its history and initial structural analyses were published in 1984.<sup>3</sup> Its use is supported by a User's Guide and, in Colorado, by a training program available through DMH. It is presently being used by four state mental health authorities: Arizona, Colorado, Hawaii and Louisiana. In revised form it is used by two other states: North Carolina and Delaware. It is also in use in numerous other programs across the country. A significant revision was made in 1987 based in part on work to be described here. That is the revision shown in Figure 1.

Twelve major areas of client personal and social functioning are screened and a profile provided of each client, indicating areas where there is trouble. A single measure of general dysfunction is also provided. Individual client CCAR profiles are constructed from an empirically derived system of scales well-suited to the description of all mental health system clients above the age of 14. The full complement of CCAR scales can be used to characterize individual clients, special populations such as adolescents, blacks, dually diagnosed persons or the entire client population.

CCAR's administrative uses are many and varied. Soon after its inception, CCAR's primary purpose was shifted away from outcome evaluation toward the identification of the most dysfunctional clients being admitted. CCAR LOF ratings were used to accomplish this. When the first Community Support Program (CSP), sponsored by NIMH, focused national attention on the seriously and persistently mentally ill (SPMI), Colorado responded with a data-based algorithm, consisting largely of CCAR items, for determining chronicity.<sup>4</sup> Later, an empirical definition of chronicity based on MHSIP and

# Figure 1. Client Admission Form

## PES-7B

State of Colorado

Division of Mental Health

Client Admission Form: Part B

(1-2) Agency Number

(3-11) Client Number

(12-17) Date of Admission

MO   DAY   YR

Record information about the client's problems and recent past (within the last three weeks unless otherwise indicated). Indicate each problem status using these codes: 1= yes 2=no 3=don't know 4=not applicable.

### SPECIAL ITEMS

Client Problems Needing Special Attention	Client Description for C.R.S. 27-10
(19) ___ Suicidal (20) ___ Assaultive (21) ___ Walkaway potential	(22) ___ Gravely disabled (23) ___ Danger to self (24) ___ Danger to others
Long Term History (may be longer than 3 weeks)	
(25) ___ Ever victim of physical abuse (26) ___ Ever victim of sexual abuse (27) ___ Ever alcohol/drug abuse in client's family	

4. Substance Use
(60) ___ Alcohol (61) ___ Other drug (62) ___ Dependent/addicted (63) ___ Int'fers w/respons'ties

8. Socio-legal
Anti-social: (20) ___ Disregards rules (21) ___ Dishonest (22) ___ Resistant (23) ___ Belligerent (24) ___ Uses/cons others
Legal: (25) ___ Offenses vs property (26) ___ Offenses vs persons (27) ___ DU/DUID arrest/convictn (28) ___ Has legal problems now

5. Family
Family Problems: (64) ___ Prob w/primary partner (65) ___ Prob w/other relative (66) ___ Parenting problem (67) ___ Family instability (68) ___ Family violence
(69) ___ Intra-family legal (either civil or criminal)

### PERSONAL PROBLEM PROFILE

1. Feeling/Affect/Mood	2. Thinking
<b>Anxiety:</b> (28) ___ Anxious (29) ___ Fearful (30) ___ Nervous (31) ___ Guilty (32) ___ Sleep problem  <b>Depression:</b> (33) ___ Depressed (34) ___ Worthless (35) ___ Lonely (36) ___ Bored  <b>Mood:</b> (37) ___ Mania (38) ___ Hyperactivity (39) ___ Mood swings (40) ___ Underactivity	<b>Prob w/Ment Ability:</b> (41) ___ Memory (42) ___ Intellect (43) ___ Confusion (44) ___ Impaired judgment (45) ___ Attention span (46) ___ Learning disability  <b>Thought Disorders:</b> (47) ___ Bizarre (48) ___ Repeated thoughts (49) ___ Hallucinations (50) ___ Delusions (51) ___ Suspicious (52) ___ Paranoid
	3. Medical/Physical
	(53) ___ Acute illness (54) ___ Chronic illness (55) ___ Nutrition/weight (56) ___ Eating disorder (57) ___ Central neurol disorder (58) ___ Permanent disability (59) ___ Injury by abuse/assault

6. Interpersonal
(70) ___ Prob w/friend(s) (71) ___ Social skills problem (72) ___ Estab'g rel'ships (73) ___ Maint'g rel'ships

7. Role Performance
Work/School: (74) ___ Absenteeism (75) ___ Performance problem (76) ___ Behavior problem (77) ___ Termination/Expulsion
(78-80) <input type="text"/> <input type="text"/> <input type="text"/> Key Only

9. Self Care/Basic Needs
Self Care Problems: On own and age appropriately: (29) ___ Doesn't care for self (e.g. hygiene, dress) (30) ___ Doesn't read or write (31) ___ Doesn't manage money (32) ___ Doesn't earn (33) ___ Doesn't make use of available resources
Basic Needs: Age-appropriately, does not provide own: (34) ___ Food (35) ___ Clothing (36) ___ Housing (37) ___ Transportation

RATE THE CLIENT'S LEVEL OF FUNCTIONING IN EACH AREA AS OF DATE OF LAST CONTACT  
INDICATE THE RATING WITH A VERTICAL MARK ANYWHERE ON THE LINE

REFER TO CCAR USER'S MANUAL FOR DESCRIPTIONS OF SCALES AND ANCHOR POINTS

	ABOVE AVG. FUNCTIONING	AVERAGE FUNCTIONING	SLIGHT DYSFUNCTION	MODERATE DYSFUNCTION	SEVERE DYSFUNCTION						
	5	10	15	20	25		30	35	40	45	50
1. Feeling/Mood/Affective Processes	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(38-39)
2. Thinking/Mental Processes	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(40-41)
3. Medical/Physical	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(42-43)
4. Substance Use	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(44-45)
5. Family/Living Situation	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(46-47)
6. Interpersonal Relations	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(48-49)
7. Role Performance	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(50-51)
8. Socio-legal	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(52-53)
9. Self Care/Basic Needs	-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----										(54-55)

Name of Reporter: \_\_\_\_\_ Discipline: \_\_\_\_\_ Degree: \_\_\_\_\_

Discipline: 1=None 2=MH Worker 3=Nursing 4=Soc Work 5=Psychology 6=Psychiatry 7=Other  
Degree: 1=None 2=Associate 3=Bachelors 4=Masters 5=PhD./Psy.D./EdD 6=M.D. 7=Other

78-80    Key Only

PES-7B (3-87)

CCAR items was developed and adopted as the current Colorado state definition in 1989.<sup>5</sup> In 1982, Colorado implemented a system of bed allocation for adult psychiatric beds at its two state hospitals. CCAR was used to determine if the case mix of incoming patients at the two hospitals changed as the result of bed allocation. On the basis of analyses of CCAR items and LOF ratings, the case mixes of the hospitals grew more similar following bed allocation, followed, in time, by converging length of stay (LOS) figures.<sup>6</sup>

CCAR is being used clinically at one center as an aid to problem identification in the context of a problem-oriented clinical record. A demonstration of its use in clinical administration is just now beginning at another center. In addition to its administrative uses, CCAR has been used to evaluate a program for the seriously and persistently mentally ill.<sup>7</sup> In 1986, NIMH awarded a contract to explore the possibility of including level of functioning (LOF) measures in the MHSIP minimum data set.<sup>8</sup> Although no particular LOF measure was recommended, CCAR met more criteria than did any other measure evaluated. CCAR has been and is currently being used as a research tool. An analysis of CCAR items<sup>9</sup> led to the identification of four SPMI types which are now the basis for classifying subjects in a large ongoing NIMH-funded treatment outcome study in Colorado.

Historically, some studies incorporating CCAR data have restricted their investigations to isolated items or general measures of dysfunction based on a limited set of items<sup>6,10</sup> or to special populations such as the seriously and persistently mentally ill.<sup>9</sup> Other studies have focused only on the nine LOF scales and not on the entire instrument.<sup>11,12</sup> Failing to identify a clear structure within the nine scales, these investigators incorrectly concluded CCAR measures were unstable and of little use. Such practices and findings greatly underutilize the information contained within the CCAR and limit the valid use of that information.

## **Recent Research on the CCAR**

Research was conducted over the last several years aimed at obtaining a thorough understanding of the current instrument, including both its strengths and limitations. A research plan was designed to guide the investigative process through a series of steps. In accordance with the plan, studies of the structure, scaling, generalizability, client typologies and utility of the CCAR were undertaken. This work is the subject of three papers to be submitted for publication elsewhere.<sup>13-15</sup> A summary of these papers is included here to provide background for the studies to follow.

### **Structure<sup>13</sup>**

Large numbers of CCARs from a representative sample of mental health clients were analyzed to identify item patterns (factors). Factors are items that go together and collectively share a common theme. Factor procedures for this and other reported analyses were done by using principal axis factoring with iterations for commonalities and oblique rotations. Items in this analysis grouped themselves unambiguously into 13 factors, and each factor could be clearly identified as a different construct related to functioning. Factoring of the 13 primary factors allowed three independent broad dimensions to be discovered. They each consisted of a unique combination of factors from within the original 13. These three broad dimensions, labeled self-care/thinking, acting out and emotion, represent broad influences similar to those reported by Eysenck.<sup>16</sup> Two of the original 13 factors remained apart from the three broad dimensions. These were interpersonal functioning and generalized dysfunction.

### **Scales<sup>13</sup>**

The response to each item in a factor was changed to either 1 = problem or 0 = no problem, making it possible to obtain a scale score by simply adding up the item responses.<sup>17</sup> The scale scores mirrored

factor scores obtained from the factor analysis and thus could be used to easily and accurately measure dysfunction in each area defined by a factor.

### **Generalizability<sup>14</sup>**

It was recognized that the sampling procedure used in the above analysis might have biased the findings. To be certain the 13 factors and three broad dimensions could be found across different kinds of clients, separate analyses were performed on 10 different client samples. Each sample was defined by a unique combination of age, severity and persistence, e.g., severely dysfunctional adolescents, non-severe adults, SPMI seniors. The same 13 factors and three broad dimensions were consistent across each sample except young children, a finding interpreted to mean CCAR scales could be relied upon to describe most of the mental health population.

### **Typology<sup>15</sup>**

Scale scores for each of the three broad dimensions were used to create a client typology. Since the three dimensions were relatively independent, it was reasonable to assume that combinations of high and low scores might be used to define two<sup>3</sup> or eight client types. In creating such a typology, it is best to define high and low scores taking into consideration the range of scores across dimensions as well as within a dimension. The specific methodology for accomplishing this is a quick cluster procedure.<sup>18</sup> It was used here iteratively, starting with seeds for high and low scores for each of the three dimensions, until stability was achieved and all members of a large ( $N = 10,485$ ) representative sample of mental health clients were classified by type.

These types can be described as follows. If an individual client had a low score on self-care/thinking, another low score on acting out and a third low score on emotion, this classified him or her as a Type 1. A pattern of low-low-high meant the person was Type 2, low-high-low, Type 3, and so forth. If the pattern was high scores on all three scales, the person was a Type 8. Holding the order of the dimensions constant, i.e., self-care/thinking in the first position, acting out in the second and emotion in the third, then the eight possible types are as follows:

- Type 1 LLL = mild dysfunction in all areas
- Type 2 LLH = dysfunctional in emotion only
- Type 3 LHL = dysfunctional in acting out only
- Type 4 LHH = emotion with acting out
- Type 5 HLL = dysfunctional in self-care/thinking
- Type 6 HLH = self-care/thinking with emotion
- Type 7 HHL = self-care/thinking with acting out
- Type 8 HHH = serious dysfunction in all areas

This file of classified clients was essential for the next step.

In order to quickly and easily classify other clients, a formula was needed that could predict client type directly from scale scores on the three broad dimensions. Discriminant function analysis, using cluster analysis client type as the criterion, led to a formula that correctly predicted client type for 98% of the cluster analysis client file. This high level of accuracy meant typing could be extended easily and reliably to other files that might include past, present or future clients with complete CCARs.

The research results reported to this point lay the conceptual and psychometric groundwork for a valid client assessment system. Elements of this system might ultimately be used to predict the intensity, duration and kinds of services that various types of clients need. The ability to do this would greatly facilitate program planning, monitoring and evaluation. Three studies reported below explore some of the possibilities.

## CCAR: Utility

Mental health administrators want to know how their systems are performing. There are many ways to measure mental health system functioning. Some more important measures include service utilization by type of service, who should be billed and how much, episode length and episode cost. Ways to predict these measures from client characteristics are continually being explored, e.g., diagnostically related groups (DRGs). As stated earlier, good service system design and monitoring begin with a clear understanding of the system's clients. But clients can be characterized in many ways, and in order to proceed, the amount of client data must be reduced to a manageable size. The CCAR client typology described above represents one such way. It contains a small number of meaningful types and lends itself well to studies of service system measures. Three such studies are reported here: (1) service utilization by type of service, billing and episode cost; (2) service intensity and episode length; and (3) length of stay (LOS) and case mix differences in two state hospitals.

### Service Utilization, Billing and Episode Cost

The study reported here uses the CCAR typology with the SERVICES data base, described above, to predict service utilization, who is billed and episode cost by client type. Clients in this study ( $N=2,661$ ) were 15 years of age or older and had been admitted to any of the 17 mental health centers or three specialty clinics in the Colorado public mental health system.

Each client was first classified into one of the eight CCAR types by using the formula developed for that purpose. Average units of service per episode for the eight services defined above were calculated, along with average dollars billed per episode. Units of service are defined by location (inpatient, residential) or time (one unit of day care = two to four hours, short day care = one to two hours, individual = 15 minutes to one hour). The percent of episode dollars billed that went to the patient's family, health insurance, Medicare, Medicaid and other were also calculated for the sample. The results are shown in Table 1.

A distinguishing feature of Table 1 is the distribution of clients by type: 62.8% of the sample is found in Types 1 and 2 compared with 6.0% in Types 7 and 8. By comparison, self-care/thinking is high in Types 5, 6, 7 and 8, and collectively these are only 21.5% of the sample. Types 3 and 4 each comprise about 8% of the sample. These findings suggest that large numbers of clients coming into Colorado's public mental health system are mildly dysfunctional and are seeking help with problems broadly defined as affective or emotional.

The patterns of service utilization, reading across by type, are almost unique to type. Types 1 and 2 have roughly the same profile with slightly more residential and partial care going to Type 2, while in contrast, Type 8 uses the most services across the board. This patterning of services supports the general observation by administrators that a few, relatively small groups of clients use many kinds of services in large amounts. The CCAR typology identifies these groups by using admission data.

Dollars billed per episode primarily reflects the differential use of high-cost inpatient and residential services. Again Types 1 and 2 have the lowest dollar figures, and Type 8 the highest. Billing patterns are as might be expected with significant portions of dollars billed going to Medicare and health insurance. In the case of Types 1 and 2, the client's family is billed at roughly 3 times the levels for the other types. For Type 6, 33.8% of dollars billed is billed to health insurance. Type 6 also has the second highest dollars per episode and the highest utilization rate for residential treatment.

As a general rule, clients with high scores on any one scale tend to use more services than those with low scores on that scale. For example, clients with high scores on self-care/thinking collectively have higher service utilization rates than clients with low scores on that scale. In summary, the CCAR typology apparently not only classifies clients in meaningful ways with respect to their problems and LOF but also with respect to service utilization and billing.

Table 1

## Service Utilization by Type of Client

Type of Client	N	%	Types of Service <sup>1</sup>				
			Inpatient	Residential	Partial Care	Out-patient	Case-Management
1	830	31.2	.6	.2	.7	6.2	1.1
2	815	30.6	.1	1.0	2.0	6.9	.9
3	218	8.2	.1	1.2	3.7	4.0	1.1
4	227	8.5	1.1	2.4	2.4	5.8	1.2
5	156	5.9	0	4.5	5.0	10.1	2.7
6	255	9.6	.6	8.0	6.6	10.7	2.9
7	67	2.5	2.3	3.8	6.4	6.5	2.6
8	93	3.5	2.8	4.0	11.1	14.6	3.4

1. Information shown is for the treatment episodes of 2661 randomly selected Community Mental Health Center open cases and admissions from FY 85 (1st qtr) and FY 86 (1st qtr). Data in the table are average units of service per treatment episode.

Type of Client	Average Dollars Billed per Episode	Percent Billed To:-----				
		Patient's Family	Health Insurance	Medicaid	Medicare	Other
1	\$190	19.9	34.5	3.5	38.7	3.4
2	310	17.7	22.1	9.9	46.2	4.1
3	362	6.2	24.8	0	63.7	5.3
4	348	7.2	22.8	3.1	66.9	0
5	467	1.5	4.7	5.9	84.0	3.8
6	653	1.9	33.8	6.6	55.8	2.0
7	505	1.9	8.6	1.6	87.4	.5
8	893	2.4	1.7	7.9	83.8	4.2

These findings also raise many other questions. Why should the use of individual-brief therapy (15 minutes of outpatient care) be so high for Type 8? Why should Type 5 clients use no inpatient services? Why should the Medicare billing rate be highest for Type 2? On the basis of results reported, the variability in type and utilization data appears sufficient to warrant further study with the goal of answering these and similar questions.

### Service Intensity and Time Treatment

A second study of service utilization was conducted by using the CCAR typology. Clients ( $N=2590$ ) were selected from the SERVICES data base. They were 15 years of age or older with admissions to any of the 17 mental health centers or three specialty clinics in the Colorado mental health system.

Two measures of service were selected: use of intensive treatment modalities and episode length. Episode length was divided into five categories: 1 = 1 to 29 days, 2 = 30 to 119 days, 3 = 120 to 209 days, 4 = 210 to 299 days and 5 = 300 to 354 days. The array of modalities, ranging from inpatient through day care to outpatient, was split at day care, creating two levels: 1 = long day care, residential or inpatient; 0 = short day care or less intensive. Two analyses were done: type by treatment intensity and type by time in treatment. Each of these is discussed in turn.



**TABLE 2**  
**Treatment Intensity for CCAR Client Types**  
**(N And Percent of Type)**

TYPE	INTENSITY		Total
	Short Day or less	Long Day or more	
1	890 97.5	23 2.5	913 35.2
2	576 88.6	74 11.4	650 25.0
3	150 93.8	10 6.3	160 6.2
4	179 94.2	11 5.8	190 7.4
5	139 82.7	29 17.3	168 6.5
6	240 77.9	68 22.1	308 11.9
7	56 72.7	21 27.3	77 3.0
8	90 72.6	34 27.4	124 4.8
Column Total	2320 89.6	270 10.6	2590 100.0

Results of the type by treatment intensity analysis are shown in Table 2 and are summarized as follows. Only 270 (11%) of all clients received any intensive treatment, but Types 5, 6, 7 and 8, totaling 152 (56%), were anywhere from 5 to 9 times more likely to receive it. These types (5–8) all have high scores on the self-care/thinking scale and might be expected to receive more intensive treatment. In contrast to the target types, only 2% of non-target clients received more intensive treatment.

Results of the type by time in treatment analysis may be found in Table 3. About one-half of Type 1 clients have short episodes (four months or less) and one-fourth have long episodes (10 months or more), while about 40% of Type 2 clients have short episodes and 37% have long ones. Type 3 is predominantly short episode; Type 4 is evenly divided across episode lengths. More than 50% of Types 5 and 6 have long episodes. Type 7 has both long and short episodes, while Type 8 has almost two-thirds of its total number in the longest episode category. With the exception of Types 5 and 6, each type has a definitive distribution of episode lengths, and, in general, the higher numbered types have longer episodes. Also, there appears to be sufficient variability within and among types to warrant further study.

It appears the CCAR typology may be of use in predicting service intensity and episode length. If so, profiling approaches such as this may be useful in guiding utilization reviews or triggering quality assurance inquiries.

**TABLE 3**  
**Days In Treatment for CCAR Client Types**  
**(N and Percent of Type)**

TYPE	DAYS OPEN					Total
	1-29	30-119	120-209	210-299	300-365	
1	252 27.6	241 26.4	115 12.6	90 9.9	215 23.5	913 35.2
2	146 22.5	122 18.8	76 11.7	68 10.5	238 36.6	650 25.0
3	72 45.0	37 23.1	16 10.0	12 7.5	23 14.4	160 6.2
4	48 25.3	45 23.7	24 12.6	25 13.6	48 25.3	190 7.4
5	17 10.1	29 17.3	14 8.3	18 10.7	90 53.6	168 6.5
6	51 16.6	48 15.6	18 5.8	21 6.8	170 55.2	308 18.4
7	19 24.7	15 19.5	7 .15	9 10.5	27 36.8	77 3.0
8	17 13.7	10 8.1	9 7.3	7 5.6	81 65.3	124 4.8
Column Total	968 37.3	642 24.8	302 11.7	249 9.6	665 25.7	2590 100.0

### State Hospital Length of Stay

Length of stay (LOS) at Colorado's two state hospitals, Colorado State Hospital (CSH) and Fort Logan Mental Health Center (FLMHC), has become a concern in recent years. About three years ago, routine monitoring by DMH revealed treatment episodes of adult psychiatric inpatients at FLMHC had become noticeably longer than those at CSH. One explanation offered at the time was that differences in the kinds of patients served by the two hospitals had developed and this was somehow related to the differences in LOS. To test this explanation, studies were designed using conventional classifications such as age, sex and DSM-III-R diagnosis. The studies failed to show any noteworthy differences in the relative frequencies of these classifications at the two hospitals.

Therefore, two studies were designed, one to determine if the CCAR typology was capable of detecting case mix differences between the two hospitals where other classifications had failed, and the other to explore LOS differences by directly using the CCAR typology and a sample of discharged patients.

The first study examined CCAR typology case mix differences in an open case sample of patients in treatment on June 30, 1988. All patients were first classified within the eight-member CCAR typology. The *N* and percent of each patient type were then calculated for both hospitals' case mixes. Differences in case mix were statistically significant ( $\chi^2 = 14.1, df = 7, p < .03$ ) but slight. There were more of Types 5, 6, 7 and 8 (all with high dysfunction on self-care/thinking) at FLMHC than at CSH. In fact, only 43.3% of the CSH case mix was comprised of these types, while the corresponding figure for

TABLE 4

Case Mix and Length of Stay (LOS) for Patients Discharged from Colorado's Two State Hospitals in FY 1986-87

TYPE	CSH			FLMHC		
	N	%	Median LOS	N	%	Median LOS
1	71	7.1	28.3	33	11.2	21.9
2	166	16.6	21.2	38	18.2	18.2
3	52	5.2	16.8	22	7.5	55.2
4	97	9.7	24.9	25	8.5	36.8
5	127	12.7	37.1	44	15.0	59.4
6	201	20.1	38.4	57	19.4	40.3
7	152	15.2	45.2	49	16.7	73.4
8	136	13.6	38.7	26	8.8	119.0
Total	1002	100.0		249	100.0	

FLMHC was 76.3%. In contrast, numbers of patients with a DSM-III-R diagnosis of psychosis were nearly identical for both hospitals,  $N = 109$  and  $N = 108$  for CSH and FLMHC, respectively.

The second study was done with a sample of patients discharged during fiscal year 1986-87. Again, patients were classified into the eight-member typology by using their admission CCARs. The numbers of each CCAR type and their median lengths of stay were then compared for each hospital. The results are shown in Table 4.

Type 1, 2 and 6 patients discharged that year required roughly the same length of stay at both hospitals. For Types 3, 4, 5, 7 and 8, the episode length for FLMHC discharges was from 1.5 to 3 times longer than for the same patient types at CSH.

In sum, the CCAR typology provided evidence of type differences between the two hospitals that were not otherwise apparent in both the open case case mix study and the discharge LOS analysis. Precisely how differences in LOS may be related to case mix or typology will require further study. Whatever effect type differences may have on discharge LOS, it is interesting to note that type differences reported for the open cases sample are based on CCAR data obtained at admission for patients in that sample. Perhaps constant monitoring of admission client types could provide early warning of important changes in case mix.

All three studies provide clear evidence of type-related differences on diverse service system variables. The CCAR typology possesses sufficient predictive validity to be of use in relating client characteristics to administrative and planning needs.

## Summary and Conclusions

Colorado has an extensive management information system of which the CCAR is a significant part. The CCAR in practice screens 13 areas of personal and social functioning, assessing an incoming client's problems and degree of dysfunction both generally and specifically. Despite successful early applications, it was dismissed in some studies as invalid and of little use. These considerations, as well as the need to settle some questions about its structure, generalizability and scaling, led to a plan of research.

The research led directly to the discovery of a structure consisting of 13 primary factors and three broad dimensions. Scales were developed for each factor/dimension and tested. The research included the creation of an eight-member client typology based on the three broad dimensions, and a simple formula was developed for classifying any client by type.

The client typology was validated in several ways, but three studies of particular interest to mental health administrators are described here. In the first study, the CCAR typology appeared to identify large numbers of clients with mild, possibly time-limited dysfunction and smaller numbers of clients with more serious dysfunction. Patterns of service utilization were almost type-specific, as were episode costs and billing patterns.

Similar results were obtained in the second study, which collapsed services into two levels of intensity. More dysfunctional types received more high-intensity services. In addition, type differences were found for time in treatment, with less dysfunctional types having less treatment time and more dysfunctional types having more time. In both of these studies, there was evidence of sufficient variability among the types and in the measures to suggest that additional, more specific questions about service utilization might be fruitfully explored.

The third study addressed the possibility that length of stay differences might be related to patient type and, further, that LOS and case mix differences between two state hospitals might be related. The CCAR typology was used to demonstrate there were no LOS differences between hospitals for three types of patients and marked differences for five other patient types. Despite having similar numbers of patients diagnosed as psychotic in their case mixes, the hospital with the longer lengths of stay had more of the seriously dysfunctional patient types in its day-to-day case mix. Although the higher numbered types had longer lengths of stay at both hospitals, no clear relationship between LOS and case mix was established, however. Results from all three studies were taken as evidence of CCAR's validity and utility as a management tool.

The CCAR typology is the product of a different approach and is unlike classifications based on diagnosis or single-scale LOFs or other *a priori* systems. It is even unlike systems derived by using hierarchical clustering of symptoms. Principally, it integrates information from multiple areas of personal and social functioning and expresses that information in the form of relative contributions from three broad, recognizable independent constructs to the definition of a type. The CCAR typology, based on several level of functioning measures, more accurately describes the whole person and therefore is likely to be more successful than other classification systems in predicting service variables and outcome measures, such as time in treatment.

The CCAR itself has some limitations. Individually and at low levels of aggregation, the instrument is open to rater bias both in the numbers and patterns of problems checked and the LOF ratings. It also suffers from being the product of one perspective, namely, the clinician. These problems can be corrected by moving the level of predictive validity closer to the client. Examples of the work needed include analysis of CCAR data on the same client from multiple occasions and from multiple perspectives, most notably the client perspective, and identification of the points at which multiple perspectives converge and diverge. Mapping other classification systems onto the CCAR system would also be informative, as would the identification of subtypes within each system.

Further developments include specification of a services typology and modeling of the interface between client and services typologies and modeling of change in LOF over multiple occasions and from multiple perspectives. The authors are currently working on all of the above.

Reasonable goals might be to forecast, on the basis of CCAR data, the following: time in treatment for any individual entering treatment, what kinds of treatment that person will need — how many and how much of each and whether the person will require public financial support — how much and from where.

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