

Studies of Illness in the Aged

The Index of ADL: A Standardized Measure of Biological and Psychosocial Function

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The Index of ADL was developed to study results of treatment and prognosis in the elderly and chronically ill. Grades of the Index summarize over-all performance in bathing, dressing, going to toilet, transferring, continence, and feeding. More than 2,000 evaluations of 1,001 individuals demonstrated use of the Index as a survey instrument, as an objective guide to the course of chronic illness, as a tool for studying the aging process, and as an aid in rehabilitation teaching. Of theoretical interest is the observation that the order of recovery of Index functions in disabled patients is remarkably similar to the order of development of primary functions in children. This parallelism, and similarity to the behavior of primitive peoples, suggests that the Index is based on primary biological and psychosocial function, reflecting the adequacy of organized neurological and locomotor response.

THE NEED FOR improved measures of function has long been evident to those who are concerned with the increasing problems of the aged and chronically ill. Investigators and those who care for patients need means to evaluate the results of treatment, as well as quantitative information about the natural changes of function in the ill and well. Administrators could use measures of function to assess the needs for care in such community facilities as hospitals, rehabilitation centers, nursing homes, and home care programs.

In response to these needs, the staff of the Benjamin Rose Hospital, a hospital for patients with prolonged illness, undertook 8 years ago to develop measures of function. One measure was cast in terms of the activities of daily living, activities which people perform habitually and universally.

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The studies led to the development of a graded scale, termed the "Index of Independence in Activities of Daily Living"¹ (Index of ADL). Applications of the Index were later demonstrated in studies of the natural course of illness and results of treatment.^{2,3}

The purpose of this paper is to compare patterns of function revealed in the Index of ADL with patterns of function described in the fields of childhood development and anthropology. The comparison reveals remarkable similarities which offer evidence of related physiological mechanisms and which tend to validate the Index as a true measure of primary biological and psychosocial function. In order to accomplish the above purpose, material will be presented as follows: first, a summary of the Index, its definitions, and use; second, the observations in 1,001 patients which serve as factual basis for theoretical considerations; and, third, the theoretical considerations themselves. Comments on practical applications and significance are included where pertinent.

Method

The Index of ADL was developed from observations of a large number of activities performed by a group of patients with fracture of the hip.¹ The Index permits ranking of individuals according to adequacy of performance. Adequacy is expressed as a grade (A, B, C, D, E, F, G, or Other) which summarizes over-all performance in six functions, namely, bathing, dressing, going to toilet, transferring, continence, and feeding (Table 1).

The observations reported here were made by physicians, nurses, sociologists, and other professional observers trained by the original investigators and experienced with the aged and chronically ill.

The observer first made three or four sample evaluations, using printed forms as guides (Tables 1 and 2). The sample evaluations were reviewed with a previously trained observer, checking definitions and methods of observation. Simultaneous observations, recorded independently were then made and information compared. By this means,

Table 3.—Index of ADL Classification of Persons in Various Community Settings Where the Aged Receive Care

	Nature of Sample†	Index of ADL Class* (Persons, No.)								Total
		A	B	C	D	E	F	G	Other	
Home care program	Consecutive applicants during 1 year	24	16	6	3	29	16	13	11	118
Home for the aged	Consecutive admissions during 1 year	9	6	5	2	3	4	2	0	31
County hospital for prolonged illness	1 in 4 random selection of consecutive admissions excluding custodial and terminal patients	11	15	12	5	77	54	30	5	209
General hospital	One-day survey of all patients in hospital for 30 days or longer	41	3	1	19	10	6	0	0	80
Outpatient clinic of general hospital	1 in 5 random selection of consecutive new medical admissions during a 3-month period	27	0	0	1	0	0	0	0	28
Dischargees from hospital for prolonged illness (evaluated 6 months after onset of illness)	Consecutive admissions: fracture of the hip	52	21	8	5	19	13	9	3	130
	Consecutive admissions: first cerebral infarction	20	12	4	6	14	15	13	2	86
	Consecutive admissions of all with cerebral infarction during 1 year	11	4	9	3	9	14	6	4	60
Nonhospitalized patients with multiple sclerosis	Consecutive admissions to longitudinal study of nutrition	41	18	8	7	6	8	7	8	103
Hospitalized patients with hip fracture	Consecutive admissions to longitudinal study of urinary tract infections	1	2	1	1	41	8	1	3	58
Custodial patients	Consecutive admissions to hormone therapy study	7	5	4	3	11	16	11	0	57
Practices of orthopedic surgeons	Consecutive patients with fracture of the hip who were not admitted to chronic disease hospitals (evaluated 1 year after fracture)	18	8	3	0	5	2	1	4	41
Total										1,001

*Text for detailed definitions of Index of ADL. Samples were from Visiting Nurse Association of Cleveland (home care program), Lutheran Home for the Aged (home for the aged), Highland View Hospital W-120 Study (county hospital), l'Hôtel-Dieu de Montréal (general hospital), University Hospitals of Cleveland (outpatient clinic), the Benjamin Rose Hospital (dischargees from hospital for prolonged illness), Nutrition study of Dr. Harold B. "Urinary Tract Infections" study of Dr. William B. Newberry, "Hormone Therapy in Older Persons" study per James E. Miller (practices of orthopedic surgeons), and practices of five orthopedic surgeons and the staff orthopedic service of University Hospitals of Cleveland (practices of orthopedic surgeons).

thing dependence in addition to incontinence and dressing dependence (grade of D).

Environmental artifacts that tend to influence ADL levels are occasionally encountered. For safety reasons, some hospitals require nurses to supervise patients who shower or get into tubs. During the first few days in the hospital, patients are sometimes kept in bed until the staff can assess their behavior and the degree of independent permissible. In some nursing homes, patients are kept in bed and not permitted to dress. For safety and convenience, water for bathing and clothes for dressing are sometimes brought to patients. All these special conditions can result in ADL ratings that are lower than they might be in absence of such restrictions. A test of actual functional level is possible and is indicated for certain studies.

Results

Since the Index was originally derived from observations of old people with fracture of the hip, it was necessary to determine whether it could be applied to others as well. Observations of 1,001 individuals, to date, supported the original finding of an ordered relationship and demonstrated wide applicability.

Of the 1,001 people, 96% could be classified by the Index (Table 3). Ninety per cent were 40 years old or older, and more than 60% were 60 or over. Most had more than one chronic disease. The primary clinical diagnoses associated with ADL disability were: fracture of the hip (250 persons), cerebral infarction (239), multiple sclerosis (138), arthritis (60), malignancy (30), cardiovascular disease exclusive of cerebral infarction (38), and amputation, paraplegia, or quadriplegia (67). In 38 other patients, the diagnoses were: cerebral palsy,

Parkinson's disease, amyotrophic lateral sclerosis, peripheral neuropathy, or other neurological disease. Less commonly, primary diagnoses included such chronic diseases as asthma, emphysema, diabetes, blindness, cirrhosis, alcoholism, malnutrition, and obesity.

Application of the Index to relatively healthy aged people was studied in one group of the 1,001 individuals, namely, in 130 persons with fracture of the hip. Complete physical examinations were performed on the 130 and revealed 23 who had no major chronic disease aside from the accident of fracture. Before fracture all 23 had been graded as A by the Index. Further evidence of their good health was noted in the fact that 18 of the 23 recovered completely after fracture and sustained their recoveries for 2 years or longer.

In addition to the results of single evaluations presented in Table 3, multiple evaluations made at different times were available in 541 of the 1,001 individuals. Of 2,120 such evaluations, 97% could be classified according to the Index.

The order inherent in the Index is illustrated by the fact that 93% of the evaluations could be assigned to either of two ordered sets of patterns. The basic set of patterns included 86% of the evaluations and is graphically presented as follows: Independent.

Dependent in bathing.
 Dependent in bathing and dressing.
 Dependent in bathing, dressing, and going to toilet.
 Dependent in bathing, dressing, going to toilet, and transferring.
 Dependent in bathing, dressing, going to toilet, transferring, and continence.
 Dependent in bathing, dressing, going to toilet, transferring, continence, and feeding.

Table 1.—Index of Independence in Activities of Daily Living

The Index of Independence in Activities of Daily Living is based on an evaluation of the functional independence or dependence of patients in bathing, dressing, going to toilet, transferring, continence, and feeding. Specific definitions of functional independence and dependence appear below the index.

- A — Independent in feeding, continence, transferring, going to toilet, dressing, and bathing.
- B — Independent in all but one of these functions.
- C — Independent in all but bathing and one additional function.
- D — Independent in all but bathing, dressing, and one additional function.
- E — Independent in all but bathing, dressing, going to toilet, and one additional function.
- F — Independent in all but bathing, dressing, going to toilet, transferring, and one additional function.
- G — Dependent in all six functions.
- Other — Dependent in at least two functions, but not classifiable as C, D, E, or F.

Independence means without supervision, direction, or active personal assistance, except as specifically noted below. This is based on actual status and not on ability. A patient who refuses to perform a function is considered as not performing the function, even though he is deemed able.

Bathing (Sponge, Shower, or Tub)

Independent: assistance only in bathing a single part (as back or disabled extremity) or bathes self completely
Dependent: assistance in bathing more than one part of body; assistance in getting in or out of tub or does not bathe self

Dressing

Independent: gets clothes from closets and drawers; puts on clothes, outer garments, braces; manages fasteners; act of tying shoes is excluded
Dependent: does not dress self or remains partly undressed

Going to Toilet

Independent: gets to toilet; gets on and off toilet; arranges clothes; cleans organs of excretion; (may manage own bedpan used at night only and may or may not be using mechanical supports)
Dependent: uses bedpan or commode or receives assistance in getting to and using toilet

Transfer

Independent: moves in and out of bed independently and moves in and out of chair independently (may or may not be using mechanical supports)
Dependent: assistance in moving in or out of bed and/or chair; does not perform one or more transfers

Continence

Independent: urination and defecation entirely self-controlled
Dependent: partial or total incontinence in urination or defecation; partial or total control by enemas, catheters, or regulated use of urinals and/or bedpans

Feeding

Independent: gets food from plate or its equivalent into mouth; (precutting of meat and preparation of food, as buttering bread, are excluded from evaluation)
Dependent: assistance in act of feeding (see above); does not eat at all or parental feeding

Table 2.—Evaluation Form

Name..... Date of evaluation.....
 For each area of function listed below, check description that applies. (The word "assistance" means supervision, direction of personal assistance.)

Bathing—either sponge bath, tub bath, or shower.

- Receives no assistance (gets in and out of tub by self if tub is usual means of bathing)
- Receives assistance in bathing only one part of the body (such as back or a leg)
- Receives assistance in bathing more than one part of the body (or not bathed)

Dressing—gets clothes from closets and drawers—including underclothes, outer garments and using fasteners (including braces if worn)

- Gets clothes and gets completely dressed without assistance
- Gets clothes and gets dressed without assistance except for assistance in tying shoes
- Receives assistance in getting clothes or in getting dressed, or stays partly or completely undressed

Toileting—going to the "toilet room" for bowel and urine elimination; cleaning self after elimination, and arranging clothes

- Goes to "toilet room," cleans self, and arranges clothes without assistance (may use object for support such as cane, walker, or wheelchair and may manage night bedpan or commode emptying same in morning)
- Receives assistance in going to "toilet room" or in cleansing self or in arranging clothes after elimination or in use of night bedpan or commode
- Doesn't go to room termed "toilet" the elimination

Transfer—

- Moves in and out of bed as well as in and out of chair without assistance (may be using object for support, such as cane or walker)
- Moves in or out of bed or chair with assistance
- Doesn't get out of bed

Continence—

- Controls urination and bowel movement completely by self
- Has occasional "accidents"
- Supervision helps keep urine or bowel control; catheter is used, or is incontinent

Feeding—

- Feeds self without assistance
- Feeds self except for getting assistance in cutting meat or buttering bread
- Receives assistance in feeding or is fed partly or completely by using tubes oravenous fluids

the degree of reliability that could be achieved was such that differences between observers occurred once in 20 evaluations or less frequently.

The form that has been developed for recording ADL evaluations includes three descriptions of each function (Table 2). For each function, the observer checks the one description that is appropriate to the subject. Two descriptions would permit distinguishing between independent and dependent states; however, introduction of an intermediate description increases observer awareness of subtle distinctions, and thereby increases reliability. The form includes all the terms needed in the evaluation and has the advantage of needing no extensive guides. In the interest of maximum accuracy and reliability, the observer asks the subject to show him (1) the bathroom, and (2) medications in another room (or a meaningful substitute object). These requests create test situations for direct observation, of transfer, locomotion, and communication and serve as checks on the reliability

of information about bathing, dressing, going to toilet, and transfer. Data that is recorded on the form is then converted into an over-all ADL grade with the aid of definitions presented in Table 1. (Note from the definitions in Table 1 that the intermediate description is classified as dependent for certain functions and independent for others.)

The occasional individuals classified as "Other" do not have to be eliminated from all studies. By definition, an individual so classified is more independent than one classed as G and more dependent than one classed as A or B; thus, patients classed as "Other" can always be compared with those classed as A, B, or G. Experience also indicates that the unique profile of a person classified as "Other" tends to persist, permitting a precise determination of deterioration or improvement when changes occur. For example, a patient who is classified as "Other" because he is incontinent and dependent in dressing clearly deteriorates when he develops

In an additional 7% of the evaluations, the observed pattern differed from the basic patterns above in an ordered fashion, namely, by replacement of the last function in a pattern with the next function of the graded scale. An individual with one dependent function would thus be dependent in dressing instead of bathing, just as one with dependence in two areas would be dependent in bathing and going to toilet instead of bathing and dressing.

Degree of assistance appeared to be an ordered characteristic inherent in the Index. Patients who were graded as B or C (dependent in bathing and/or dressing) received assistance at isolated times in a given day, while those in the lower grades needed assistance at more frequent intervals (dependent in going to toilet, transferring, continence, and/or feeding). As a test of this hypothesis and as a separate measure of amount of assistance, the presence or absence of nonfamily attendant care was determined 1 year after onset of illness in 154 patients with fracture of the hip or cerebral infarction. As predicted, 79% of the patients graded as D, E, F, or G were receiving nonfamily attendant care, while this was true for only 45% of those in grades B and C ($P < 0.002$). None of those in class A had nonfamily attendants.

The ordered nature of activities in the Index suggested that one or more functions would, in themselves, be indicators of levels of over-all performance. This was verified by comparing the occurrence of dependence in going to toilet and low ADL levels in 149 people in two community surveys. The frequency of low ADL levels (D or lower) was 50% and was, indeed, reflected by the occurrence of dependence in going to toilet in 52%.

The orderly arrangement of grades in the Index, from more to less dependent, also suggested that individuals who were recovering from disabling illness might show a similarly ordered sequence of improvement. Order of return of function was, therefore, studied in consecutive patients who were completely dependent or dependent in all but one function when admitted to the Benjamin Rose Hospital. Among 279 consecutive new admissions, 100 met these criteria. Independence in feeding was present alone on admission, or was the first function to return, in 42 of the 58 patients who showed any return at all. Continence was the first independent area for 13 patients, while feeding and continence returned simultaneously in three patients. Continence was, most commonly, the second function to reappear; it was second to reappear in 16, and feeding was second in 7. Transferring and going to toilet were the next functions to become self-regulated. In eight, independent transfer occurred before independent going to toilet. In eight others, transfer and going to toilet returned concurrently, or going to toilet preceded a return in transfer by less than a week.

Though many patients participated in their own bathing and dressing while in the hospital, they were partially dependent in these functions until they were at least able to transfer independently and were thus able to get their own clothes for dressing and their own water for bathing. Few patients were kept in the hospital throughout the entire course of returning function; however, it was possible to verify the return of totally independent bathing and dressing in a group of 100 patients who were observed in follow-up studies in the home after hospitalization for cerebral infarction. Return of complete independence in bathing or dressing was verified in 95% (21 of 22) patients who had become independent in feeding, continence, transferring, and going to toilet while in the hospital. Among 78 who did not become independent in these functions while in the hospital, only 14% showed subsequent return of independence in bathing or dressing.

In summary, these recovering patients passed through three stages: an early recovery of independence in feeding and continence; subsequent recovery of transfer and going to toilet; and, lastly, often after discharge, the recovery of complete independence in bathing and dressing. This course of events might have been predicted from knowledge of the position of individual functions on the ADL scale and from knowledge of the amount of organized activity required by each function.

Theoretical Significance

The functions which comprise the Index of ADL, and their characteristic order, bring to mind the recognized patterns of child growth and development as well as the behavior of members of primitive societies.

Pediatric texts, for example, describe the development of children largely in terms of bathing, dressing, going to toilet, locomotion, elimination, and feeding.^{4,7} Terms used in the Index, which was developed independently, are strikingly similar. Pediatric descriptions distinguish between vegetative and culturally learned behaviors, and an analogous distinction can be recognized in the activities of the Index. The definitions in the Index of feeding, continence, and transfer are, thus, recognized to reflect the organized locomotor and neurologic aspects of simple vegetative functions, exclusive of their more complex cultural and learned characteristics (see definitions in Table 1). As defined in the Index, bathing, dressing, and going to toilet also require organized locomotor and neurologic functioning, but these activities are prominently influenced by cultural forces and learning.

The order of recovery of function in the disabled adult is remarkably similar to the progression of function in the developing child. By 2 years, the child holds a glass securely and takes food into

his mouth on a spoon.^{4, 6} He is not yet completely continent and requires a great deal of assistance and supervision in bathing and dressing. By 3 years, he feeds himself and can even pour from a pitcher. Nights of wetness occur, and supervision of going to toilet is required in managing clothes and in self-cleansing. The 3½-year-old child is generally dry at night. By 4 years, he uses the toilet independently, though he may still require occasional supervision. Between 4 and 5 years, he requires only general supervision in bathing and dressing. The parallel with the order of return for the elderly disabled patient is evident and suggests that common biological mechanisms underlie the two kinds of progression.

Anthropology provides independent confirmation of the biological primacy of the functions which comprise the Index. Here again, a distinction is evident between vegetative and culturally learned functions.⁸⁻¹⁰ All peoples, primitive and advanced, develop self-regulation of feeding and elimination as requirements for survival. They also develop independent locomotion, moving from one place to another to adapt themselves and their environments to their needs. Bathing and dressing, however, are not necessities of day-to-day physiological functioning, as evidenced by the habits of children of primitive people and adults of the most primitive groups.⁸⁻¹⁰ Modified forms of bathing and dressing are, nevertheless, performed regularly and universally even by primitive peoples, as in the ritual bath and the use of loincloth, headdress, body string, arm band, necklace, mask, and fur.⁸⁻¹⁰ The cultural significance of bathing and dressing is emphasized by the symbolic and ceremonial use of dress to express strength, rank, courage, and sexual maturity, and by the practice of bathing to clean away evil.^{8, 10}

The data presented in this paper indicate that the pattern of recovery from a disabling illness in later life parallels the primary development of function in the child. It might also be hypothesized that, just as there is an orderly pattern of development, there is an ordered regression as part of the natural process of aging. It seems reasonable that loss of function would begin with those activities which are most complex and least basic, while those functions which are most basic and least complex could be retained to the last. Limited observations made in the course of the studies reported here have tended to confirm this prediction. All of the subjects, however, had developed illness or disability before entering the studies, and elucidation of the natural patterns of deterioration would require a prospective study of "well" old people. The Index does provide an objective approach to such a study of the aging process if one considers aging as a composite of a number of deteriorating physiological functions. Such a study might lead to the fulfillment of Gessell's prediction that "the laws of

association will some day be reformulated in terms of the biology and physiology of development."¹¹

Practical Significance

The Index lends itself to several practical applications, some of which have already been tested, while others remain to be explored.

As one of a set of measures from which prognostic predictions can be made, the Index has proved to be a useful means of describing the patient's functional level at the time of onset of an illness such as fracture of the hip.² Such predictions make it possible to avoid prolonged therapeutic efforts in situations where the outcome is unlikely to be successful. A second important use which may be made of the Index is as a measure for comparing treatment and control groups in studies of the efficacy of treatment.³

As a tool in the practice of medicine, nursing, and rehabilitation, the Index offers a measure of desired objectivity which appeals to the practitioner because of its relevance to the patient's problems. A physician might hesitate, for example, to hospitalize a patient with rheumatoid arthritis who shows only low-grade disease activity by the usual clinical indices, since there is little rationale for using expensive hospital facilities to try to reduce already minimal signs and symptoms. An evaluation of the same patient in terms of the Index of ADL, however, focuses attention on functional deficits of major importance to the patient which could be improved by physical therapy and other means. The patient who is able to bathe and dress himself and transfer independently requires much less assistance from his family or attendants than one who is limited in these spheres.

The Index is also useful to the practitioner as a guide to progress and treatment. A patient, for example, who has had a cerebrovascular accident may not have access to physical therapy and rehabilitative services until several weeks after the onset of illness. Although there may be little likelihood of major recovery of neurologic function at this stage, intensive efforts to make more effective use of the remaining function might still result in important gains in activities of daily living. Evaluation of these activities by the Index can establish the status of the patient at the point of instituting therapy, can guide progress during therapy, and can identify the point of maximum hospital benefit.

In a modified form, the Index is used by the nursing and medical staff for recording and evaluating the functional level of patients at the Benjamin Rose Hospital. The fact that the Index is objective and based on physiological principles has also made it a useful device for teaching house officers and nursing students.

Dependence with regard to a single function, going to toilet, has been shown to be an indicator of over-all performance, dividing subjects into

groups that require significantly different amounts of assistance. The presence of dependence in going to toilet has already been used as a simple indicator of major physical need in the development of the Index of Independence in Socioeconomic Functioning, an index that combines measures of productivity, resources, and needs.¹²

Physicians and society as a whole recognize ever more keenly that the increase in the ranks of the aged brings with it increased responsibility for care in a group characterized by great dependency. Those who give care try to decrease dependency whenever possible on the premise that independence helps to sustain physical, emotional, and social strength. Independence in activities of daily living is important to such well-being and may, in fact, be a basic component in any definition of health of the aged. The measure described in this paper focuses attention on activities of daily living. It offers a means of making quantitative assessments of illness and the effects of illness, as well as providing additional means for studying the aging process.

Summary

A measure of function applicable to the elderly and the chronically ill has been developed from observations made on patients with prolonged illness. This measure, known as the Index of Independence in Activities of Daily Living (Index of

ADL), has been standardized and applied to the evaluation of a total of 1,001 individuals in various institutional and community settings.

Comparison of the elements of the Index and their inherent order with independent descriptions of childhood growth and development and with the behavior of primitive peoples suggests that the Index is based on primary biological and psychosocial functions. In an ordered fashion, the Index reflects the level of neurological and locomotor activity in primary phylogenetic functions as they are influenced by environmental and cultural forces. Individual grades of the Index can be thought of as "final common path" expressions that describe the adequacy of organized neurological and locomotor response of the organism.

The Index is proposed as a useful tool in the study of prognosis and the effects of treatment, as a survey instrument, as an objective guide in clinical practice, as a teaching device, and as a means for gaining more knowledge about the aging process.

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HOW ARE CONTACT LENSES OBTAINED?—The best place to get contact lenses is from an ophthalmologist who fits them. If one is available, there is no problem. If none is available, the best solution is to have an ophthalmologist recommend a technician who will fit the lenses under the ophthalmologist's supervision. We do not advise any other way of getting them. More and more ophthalmologists have been acquainting themselves with the fitting of contact lenses, and it has become a standard part of the training of eye residents. Therefore, in the near future the problem will no longer exist. The referral of a patient to a technician who fits lenses without continuing direct medical supervision is not in the best interests of the patient or of the referring doctor who, after all, bears the ultimate legal responsibility.—Feldstein, M.; Barnert, A.; and Agatston, H.: Recent Advances in Medicine and Surgery, *New York J Med*, May 15, 1961.