

ASSESSMENT OF THE SIX ACTIVITIES OF DAILY LIVING IN ADULTS

Dr Ng Yee Sien, Dr Heeyoune Jung

ABSTRACT

The assessment of disability including activities of daily living (ADL) is important as a clinical tool to document functional recovery as well as to assess the effectiveness of medical and rehabilitation interventions. Disability assessment is also important epidemiologically, in developing social policies, planning disability resources and in medical research and education. In this article, we review the definitions, history and advances in the field of disability assessment. We then describe the general principles of disability assessment in adults with a further detailed focus on six basic ADLs: eating, bathing, dressing, toileting, transfers and locomotion. We use a practical framework of an independent category and four dependent categories corresponding to an increasing level of assistance for each ADL. Finally we summarise the inherent problems and difficulties in disability assessment and emphasise the important role of rehabilitation in improving functional outcomes including the basic ADLs.

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INTRODUCTION

Disability or activity limitation is defined as a restriction or lack of ability to perform an activity, including ADLs as a result of an *impairment*, or loss of body structure or function^{1,2}. The prevalence of disability in Singapore is rapidly increasing for two major reasons. Advances in acute medical care result in a larger proportion of patients with chronic diseases surviving with residual impairments and disability. In addition, the ageing of the population also results in the exponential increase of the disability burden due to the direct association of increased chronic disease incidence with the more elderly³. However, it is a common misconception that disability only occurs in the elderly and preliminary local data indicates there is a large number of disabled younger adults as well, particularly with stroke, spinal cord and traumatic brain and musculoskeletal injuries⁴.

Disability results not only in individual loss of self esteem and quality of life, but also increases tremendously the social and financial burdens of their involved families, society and the country-at-large. Families need to adjust their expectations and care for the disabled, resulting in changes in family routine and activities, as well as often a loss of income as a direct or indirect consequence of loss of time

available for remunerative employment^{5,6}.

The aim of this article is to provide an overview of the disability determination of ADLs, focusing on the assessment of six ADLs that are crucial for self-care.

OVERVIEW AND FRAMEWORK OF DISABILITY ASSESSMENT

The need for accurate determination of disability arose in the early 1900s during the industrial revolution whereby a worker sustaining a work-related injury resulting in a medical impairment which affected his employability could seek redress from the courts⁷. This led to the development of workers' compensation systems in many countries, and the Ministry of Labor in Singapore has recently released updated guidelines⁸. Accurate determination of disability became essential because of the direct correlation between the degree of disability and quantum of financial remuneration common in these guidelines.

The further need and development of disability assessment moved in tandem with the exponential increase in medical knowledge as well as a worldwide change in disease profile in developed countries from one of infectious disease and *death*, to chronic disease and *disablement*. Singapore shares a common trend with most developed countries whereby the principle causes of morbidity and mortality (accounting for more than 80%) are non-communicable diseases including cancer, coronary artery disease, stroke, diabetes, hypertension and injuries⁹. This has led to spiraling health care costs for health-care systems and governments for managing both the disease itself, and the costly burden of managing the consequence of disability. The current urgent need for disability assessment could be summarised thus:^{1,10}

1. Epidemiologic data in population studies and to establish the extent of disability burden.
2. Clinical tool, both to measure baseline disability, the natural recovery of chronic disabling illnesses, as well as to assess the effects of the wide array of medical and rehabilitation interventions available on disablement.
3. Research tool for outcome measurement and factors that impact on disability.
4. Social policy instrument in planning for health care funding, insurance systems and formulation of health-care policies
5. Educational tool in medical school curriculum design, as well as for advocacy and the raising of social awareness of the disabled.

The World Health Organization (WHO) has recognised this need and continually develops conceptual disablement models for international acceptance and use, and these frameworks are employed in the development of various disability measures. The International Classification of Impairments, Disabilities

NG YEE SIEN, Consultant, Department of Rehabilitation Medicine, Singapore General Hospital

HEEYOUNE JUNG, Associate Consultant, Department of Rehabilitation Medicine, Singapore General Hospital

and Handicaps (ICIDH) developed by WHO in 1980 describes consequences of disease and disablements and is still used in the American Medical Association Guides to the Evaluation of Permanent Impairment (AMA guides)^{2,11}. The International Classification of Functioning, Disability and Health (ICF) developed in 2001 focuses on the components of health rather than the consequence of disease and further recognises the important role of the environmental factors which may include human and technological social support systems which impact on health¹. In addition, a comprehensive hierarchical coding system which includes codes for body structures and functions, various ADLs *and* the severity of the disablement are described, and these codes can be expanded to great detail allowing for further development. The ICF has been adopted by more than 190 countries throughout the world and its key elements have been incorporated into various disability assessment scales for use by clinicians and administrators involved in healthcare.

CURRENT DISABILITY ASSESSMENT TOOLS

Using definitions from the ICIDH and ICF models, the assessment of disability involves *strictly* the assessment of the severity of activity limitation including ADLs, and *not* the assessment of the severity of loss of body structure or function (or termed impairment in the older ICIDH model)^{1,2}. For example, in the common scenario of a patient who has a left middle cerebral artery stroke resulting in a right hemiparesis, it is not an assessment of degree of loss of strength of the right arm (loss of body structure/function), but an assessment of the amount of assistance a subject requires to dress himself or groom himself *because* of the loss of strength in the right arm (activity limitation). This is important conceptually because the loss of body structure/function or impairment may *not* correlate to disability and activity limitation and it is the severity of disability that is far more important in the determination of caregiver and societal burden¹².

Unfortunately, there is no consensus in the rehabilitation or geriatric literature as to what constitutes the core group of ADLs that need to be measured. However, most authorities and texts agree that ADLs can be divided into the following:¹³

1. Basic ADLs (BADL). These can include some or all of these activities deemed critical to basic self-care:
 - i. *Self-care*: Eating, Grooming, Bathing, Dressing, Toileting.
 - ii. *Continence*: Bladder and Bowel Continence
 - iii. *Mobility*: Transfers (for example bed to chair, chair to toilet seat), Walking or Wheelchair Use, Climbing Stairs
 - iv. *Cognition*: Communication including Comprehension, Expression, Memory and Simple Problem Solving.
2. Instrumental ADLs (IADL) or Extended ADLs (EADL)
This list is long, but generally involves more complex activities such as food preparation, medication use, telephone use, transportation use, housekeeping and laundry.
3. Community Reintegration and Participation Activities
These form the highest tier of activities in daily living and include employment, leisure activities, and various recreational activities.

Instruments exist that measure any or all of these three categories of ADLs. For the purposes of this discussion, we focus only on tools that measure BADL as these have the most direct and significant impact on caregiver burden. BADL assessment is also directly relevant in the disability assessment for the disability-related national schemes (DRNS) locally including ElderShield/Interim Disability Assistance Programme for the Elderly (IDAPE), Disability Protection Scheme (DPS), Primary Care Partnership Scheme (PCPS) and the Foreign Domestic Worker (FDW) Levy Concession.

There are only two major BADLs scales of disability used consistently throughout the world presently and these are the Barthel Index (BI) and the Functional Independence Measure (FIM), both of whom have undergone modifications and revisions over time¹⁴⁻¹⁷. Both these scales also have good test-retest and interrater reliability, content validity for the measurement of disability, and are sensitive to changes over time¹⁷. Importantly, there is a direct correlation between the severity of disability and the amount of care required¹²⁻¹⁸. The BI has the following items: eating, grooming, bathing, dressing, toileting, maintenance of bowel and bladder continence, transfers and locomotion. The more recently developed FIM has similar items to the BI, but further include items on cognitive BADLs such as communication skills, problem solving and memory. This reflects principles explored in the ICF that these cognitive BADLs are not only essential to everyday living and can impact on the better-known physical BADLs^{1,16}. The BI and the FIM have shortened versions which are also valid and reliable in measuring BADLs¹⁹. Similarly, the current DRNS including ElderShield/IDAPE, DPS, PCPS and the FDW Levy Concession employ selected BADL items in *self-care*, *continence* and *mobility* above and these items are essentially part of the BI and FIM.

DISABILITY ASSESSMENT: GENERAL PRINCIPLES OF DISABILITY ASSESSMENT

(In the subsequent discussion that follows, ADL is synonymous with BADL)

We provide a general applicable framework for the subsequent discussion on disability assessment (Figure 1 and Table 1). Our aim is to illustrate the key concepts of disability assessment rather than follow any particular disability scale. Throughout, we advocate the use of the terms *dependence* and amount of *assistance* rather than terms indicating the amount of *ability* in each ADL (Table 1). This is because the aims of disability assessment used in the original (including the WHO-ICF, BI and FIM instruments) and usual contexts is to correlate to the burden of care required^{1,12-18}.

Each ADL is first categorised into an independent versus dependent group (Fig 1). This dichotomisation is critical and this distinction is consistent in the disability assessment literature¹²⁻¹⁸. **Independence** is the performance of an ADL *without* the need for a helper *regardless* of whether aids (such as modified eating utensils or walking frames) are used.

Dependency is defined as the need for assistance from a helper and so, indicates presence of caregiver burden.

Total assistance or disability is clearly distinct in disability assessment. The degree of disability and the categorisation of amount of assistance between the two extremes of independence and total dependence however are subjective. The continual refinement and advancements in disability assessment aim to improve the objectivity in assessing these shades of grey²⁰.

In this article, we group each ADL into four generally accepted dependent categories for ease of discussion. In summary then, we have one independent and four dependent categories (Figure 1 and Table 1) for the discussion that follows¹²⁻¹⁸. These are:

1. Independence: No helper or assistance required.
2. Dependent: Minimal Assistance: Subject does 75% or more of the ADL.

3. Dependent: Moderate Assistance: Subject does 50 to 74% of the ADL.
4. Dependent: Maximal Assistance: Subject does 25 to 49% of the ADL.
5. Dependent: Total Assistance: Subject does less than 25% of the ADL.

General principles follow:

1. Assess and score what the subject actually does, and *not* what the subject can do.

It is important to differentiate between *capacity* (what the subject can do) and *performance* (what the subject actually does). This is because performance and *not* capacity determines caregiver burden.

Examples are:

- i) *Both* cognitive/mental and physical impairments should be taken in consideration for each ADLs. In patients

TABLE 1. Summary and Comparison Chart of Indices of Disability Assessment in Adults

Terms and Definitions used in this Article Text		Detailed Definition based on Amount of Assistance*	Definition based on Ability*	Arranged from latest → earliest time of development**				
Percentage of ADL Performed	Definition based on Amount of Assistance*			FIM [†]	MBI [‡]	BI [§]	BI [*]	Katz [#]
All	Independent	Independent	Able	7	5	3	2	Independent
		Modified Independence		6				
All 75% or More	Minimal Assistance	Supervision	Partially Able	5	4	2	1	Dependent
		Minimal Assistance		4				
50 to 74%	Moderate Assistance	Moderate Assistance		3	3			
25 to 49%	Maximal Assistance	Maximal Assistance	Not Good As Not Able	2	2	1		
Less than 25%	Total Assistance	Total Assistance	Not Able	1	1			

* In general, definitions based on the amount of assistance are preferable compared to definitions based on ability. This is because the amount of assistance better reflects the amount of caregiver burden required and had been the original aims of most of the disability scales. This does not follow the Eldersfield categorisation strictly as it is intended rather to provide a conceptual correlation to other scales.

** Various widely-used disability scales arranged from latest to earliest time of development. Note that the numbers in the columns do not refer to the points scored, but the grouping of disability categories.

† FIM: Functional Independence Measure. Note that the FIM categories correspond to the column 'detailed definition based on amount of assistance'. Each ADL is scored from 1 to 7.

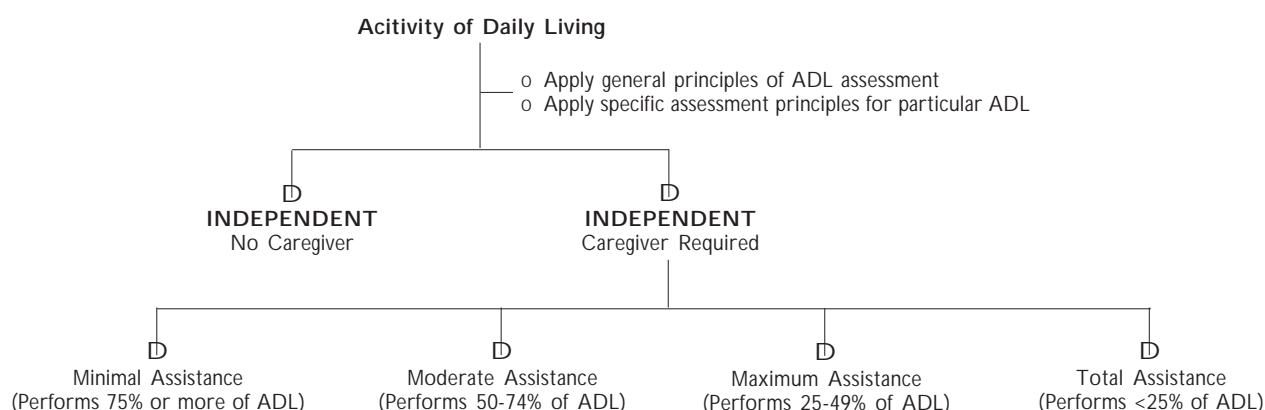
‡ MBI: Modified Barthel Index. Each ADL is grouped in five disability groups, however the weightage is different for the ADLs. For example, eating and toileting points range from 0 to 10 points (0,2,5,8,10 points respectively) whereas transfers and ambulation range from 0 to 15 points (0,3,8,12,15 points).

§BI: Barthel Index. ADLs for eating, toileting, dressing, bladder, bowel and stair climbing are grouped into three groups (0,5,10 points).

*BI: Barthel Index ADLs for toileting, bathing, and locomotion are grouped into two groups (0,5 points).

Katz Index of Independence in ADLs. The Katz Index simply dichotomises ADLs into independency or dependency and then groups all ADLs to give a summary group of A to G to determine the degree of disability.

FIGURE 1: General Schema of Disability Assessment for Each ADL for this Article Text



with dementia, they may be able to wear a shirt independently in front of an assessor (capacity), but are fully unable to do so at home because of memory impairment, severe apraxia or significant depression (performance). The subject should be scored as maximal or total assistance (performance).

- ii) A spinal cord injured patient with complete paraplegia may be able to propel a wheelchair more than 50 meters in a gym or a straight well-paved corridor. However, he is unable and does not want to do so at home because of multiple steps, small doorways or cramped confines of a single-room flat. He should be scored as maximal or total assistance (performance) because of the large caregiver burden required for household ambulation as part of his ADL.
2. Score the lowest or maximal assistance for that particular ADL if the performance on that ADL fluctuates¹⁴⁻¹⁷. This is to ensure a fair appraisal of the subject's performance and to reflect caregiver burden. Examples include:
 - (i) If a patient has severely impaired vision due to advanced diabetic retinopathy or cataracts, he may be able to transfer from bed to chair with minimal assistance in the daytime, but requires maximal assistance at night because of the high risk of falls. He should be scored as maximal assistance required for transfers.
 - (ii) If a patient has advanced rheumatoid arthritis of the hands and requiring maximal assistance in the morning in eating because of early-morning stiffness or fatigue, but subsequently performs better in the evening, he should be scored as requiring maximal assistance in eating.
 3. If an ADL has more than one component, the lowest or maximum assistance required for a particular component is the score for the ADL. Examples include:
 - (i) If a patient with a stroke requires only minimal assistance with dressing of the upper body, such as wearing a shirt,

but requires moderate assistance in dressing of the lower body, such as wearing of trousers, then the score should be moderate assistance in dressing.

- (ii) Likewise, if a subject needs only minimal assistance to move from bed to chair, but moderate assistance from chair to bed, he should be scored as moderate assistance for transfers.
4. Supervision (no contact required) is considered minimal assistance. If two persons are required for an ADL, this automatically is scored total assistance.
 5. If there is doubt in the scoring of a particular ADL, it is helpful to rephrase the question from 'how much can the subject perform' in that ADL to 'how much assistance from the caregiver' is required, as the major goal of the disability assessment is to determine caregiver burden.

PRACTICAL ADMINISTRATION OF DISABILITY ASSESSMENT: ASSESSMENT OF THE SIX ITEMS OF BASIC ACTIVITIES OF DAILY LIVING IN DETAIL

In this article, we focus on six core ADLs: eating, bathing, dressing, toileting, transfers and mobility. We use Figure 1 and the first two columns in Table 1 as the basis of the discussion that follows. We also arrange the six ADLs in order of difficulty consistent with prior disability assessment scales¹²⁻¹⁸.

In each ADL, decide firstly whether the subject performs the task independently or is dependent, and then determine the level of dependence.

EATING

Definition: Ability to feed oneself food after it has been prepared and made available. The assessment begins when someone places the food within the reach of the patient^{14,16}. It involves the following subcomponents: cutting up the food into bite-size portions, bringing food to the mouth with the

use of utensils, chewing and swallowing it safely. If a subject relies on other means of feeding, usually a nasogastric tube, then the assessment is how the subject administers the feeding himself.

Practical Points: First decide whether a helper needs to be present at all during the actual eating process to decide between independence and dependence. Amongst the six ADLs discussed, the amount of assistance is probably the most subjective for feeding. The final score needs to take into account the subcomponent with the most assistance needed.

Independence is then the ability to cut food, bring food to mouth, chew and swallow without a helper needing to be present. This is regardless if adaptive cutlery (for example long handled or built up forks and spoons) is used. If a subject feeds via a nasogastric tube, he must be able to pour the enteral feed down the tube independently. This usually requires an additional funnel to guide the feed down to the tube and he should hold the funnel independently together with the nasogastric tube.

Dependence means a helper needs to be present during the feeding process. The following are some useful guides. Minimum assistance implies that set-up in the eating process is required. This includes the helper opening containers, cutting meat, pouring liquids or helping the subject wear a cuff to hold utensils. The need for preparation of modified food consistencies such as a pureed or thickened diet would be considered minimum assistance. We would consider maximal assistance if the helper needs to scoop food onto a spoon repeatedly before the subject brings the spoon to his mouth. Examples of total assistance include the need to manually feed every mouthful *or* the need to check the mouth for residual food with each mouthful *or* the need to prompt safe swallowing with each swallow to prevent choking (for example the need to remind the patient to chin tuck and do a double swallow with each swallow).

Example: A patient has severe rheumatoid arthritis of hands. She needs assistance in cutting up food and opening containers due to restriction in hand dexterity. However, she can bring the food to her mouth by herself, chew and swallow safely any consistency of food. This would be considered minimal assistance. If however she has temporomandibular joint involvement and has a lot of pain in chewing and requires checking at every mouthful for residual food to prevent choking, this would be scored total assistance.

Other Points: Some texts consider independence of eating regardless of food consistency so long as the subject does not require a helper present¹⁶. We disagree as this represents a limitation of the swallowing component of eating and caregiver burden is present.

DRESSING

Definition: Ability to put on, take off, secure and unfasten upper *and* lower body garments. Garments will include prostheses (artificial limbs), orthoses (braces such as a thoracolumbar corset), and specialised garments which are deemed necessary for the patient, such as compression stockings for lower limb oedema. The patient should be assessed on clothing that he wears on a regular basis *and* of appropriate decency if he appears in public. We do not recommend that the wearing of undergarments and of footwear be considered as this complicates the assessment.

Practical Points: Divide the task first into upper and lower body dressing and score the amount of assistance required for each. Subsequently score the *lower* of the two scores as the ADL score for dressing. Lower body dressing is usually more difficult¹⁶⁻¹⁷.

Independence is then the ability to dress the upper and lower body completely without the need for an assistant. The subject may use aids such as a long-handled reacher to pull up his trousers if he is unable to bend his trunk.

Dependence means that a helper is required and may range from minimal assistance whereby a helper instructs verbally the steps required to put on clothes, or total assistance. If the degree of assistance becomes difficult to assess, we suggest dividing the garments in parts:

T-shirt: 3 parts: (1) thread the right sleeve, (2) left sleeve, and (3) pull it down the head and body.

Buttoned shirt: 4 parts: (1) thread the right sleeve, (2) left sleeve, (3) pull the shirt across the body, and (4) fasten (or unfasten) the buttons.

Shorts: 3 parts: (1) thread through the right leg, (2) left leg, and (3) pull the shorts up over the pelvis.

Buttoned or zipped trousers/pants: 4 parts: (1) thread through the right leg, (2) left leg, (3) pull the trousers/pants up over the pelvis, and (4) fasten (or unfasten) the buttons or zips.

Example: The stroke patient with a left hemiparesis wears a T-shirt and a pair of zipped pajama pants at home and in public. He is able to thread the left sleeve of the T-shirt with his good arm, but not the right sleeve of his T-shirt. He is however to pull the T-shirt over the head and down the body once the helper threads the right sleeve of his T-shirt for him. So for upper body dressing he performs in 2 out of 3 parts = 66.6% of the ADL = *moderate* assistance.

He is however not able to reach and thread the shorts through his right leg and left leg, but is able to pull up the pants over his trunk once it is threaded. He also needs help to pull up his zipper. For lower body dressing he performs only 1 out of 4 parts = does only 25% of the ADL = *maximal* assistance. His score for dressing would then be *maximal* assistance based on the lower score.

Other points: Garments, which are deemed necessary for the patient's condition, are best scored as an able or not able situation. For example, a patient has been prescribed a rigid thoraco-lumbar orthosis for severe osteoporosis of the spine with compression fractures for prevention of further deterioration and is instructed to wear it. If he is unable to put it on himself, then this should be scored as total assistance, and the score for dressing will be total assistance *regardless* as to the score for wearing of the clothing.

Garments that are not absolutely necessary for the patient's condition, for example a sports-type knee brace that the patient wears for warmth and comfort for osteoarthritis of the knee, should *not* then be taken into consideration in the assessment for dressing.

BATHING

Definition: Ability to wash or bathe in a bathtub, shower, or sponge/bed bath. This has the three subcomponents of washing, rinsing and drying. For practical purposes, it is reasonable to assess bathing below the neck only.

Practical Points: *Independence* is then the ability to *wash, rinse and dry* the body without the need for a helper. This is regardless of whether the subject bathes himself in a tub, showers or does a bed-bath.

Dependence indicates the need for a helper. If the amount of assistance proves difficult to establish, we suggest dividing the body into ten parts. The ten parts are the left arm, the right arm, the chest, the abdomen, the front perineal area including the genitalia, the back perineal area including the buttocks, the left upper leg, the right upper leg, the left lower leg/foot and the right lower leg/foot. Note that portions of a body part will be considered as unable, so the ability to wash only half the chest is considered as the chest is not washed.

Example: A patient who has a dense left hemiparesis can only wash, rinse and dry his left arm and chest with his right arm. He is unable to wash his right arm, abdomen, perineal region and unable to reach both the lower limbs. He performs only 2 out of 10 required steps = 20% of the ADL performed = *total* assistance

Other Points: The back is excluded from bathing, else, healthy non-disabled people may be scored as disabled. Many people do not wash their back everyday or use an assistive device like a long-handled sponge. A clearer picture of disability will result if the back is not included.

The face and neck is excluded because of two reasons. Firstly, in many of the ADL scales including the BI and FIM, washing the face and neck is a separate ADL assessment in *grooming*, and grooming may further include brushing the teeth, shaving and washing the hair. Secondly, washing the neck and the face has a fairly strong functional overlap with eating and the

functional scores generally correlate. The aim of this particular ADL assessment is to assess the disability in bathing in isolation.

Note that the definition of bathing includes *wash, rinse and dry*. The amount of assistance is often under-estimated because a subject may be able to wash, but has difficulty manipulating a towel to dry. This should be scored as unable to bathe in accordance to the general principles described above.

TOILETING

Definition: Ability to use the lavatory and manage bowel and bladder hygiene. It consists of four steps: (1) maintenance of balance, (2) adjusting clothing before using a toilet, (3) maintaining perineal hygiene and flushing the toilet, and subsequently (4) adjusting clothing after using the toilet. The definition remains the same if a bedpan or commode is used. If a bedpan or commode is used, then step (3) would be the need to clear the bedpan and commode as well.

By strict definition, do *not* take into account other aspects of toileting. This includes:

- Transferring from a bed or chair onto the toilet seat. This would be assessed under transfers.
- The actual bladder or bowel function including whether the subject is continent, leaks, soils the bed or uses a catheter. This is more correctly assessed under bladder and bowel continence.

By definition, it *includes* however:

- Maintaining the balance during clothing adjustment and the actual act of urination and defaecation.
- Perineal hygiene issues including using toilet paper to clean the perineum and the ability to flush the toilet or clear the bedpan.

If a subject uses a diaper, then the assessment includes the entire process of removing the diapers, perineal hygiene, putting on a new diaper, and discarding the old diapers.

If a subject is on a long-term indwelling catheter, do not assess the component of changing the catheter under toileting, as there is usually no caregiver burden involved. If a subject is on self intermittent catheterisation, then he should be assessed as per the definition of toileting given above.

Practical Points: To determine the level of assistance required, it is often useful to divide the ADL into four steps listed above. For ease of assessment, a part of a component that is not performed should be scored as not performed.

Independence: No helper required to perform all four steps.

Dependence: Minimal, moderate, maximal and total assistance would then be the inability to do 1, 2, 3 or all 4 steps described in the practical points above.

Examples: A bed bound severe stroke patient who requires a helper to change his diapers is assessed as total assistance. Another stroke patient who uses a bedpan can remove and put on his clothing but requires a helper to lift his pelvis onto a bedpan (balance), and clean his perineum and carry the bedpan away after use. This implies that he can do 2 out of 4 steps and this would be considered moderate assistance. If the same latter subject can only thread one leg during the removal and putting on of his pants, he would be considered as unable to do these steps as well. This would imply that he can do none of the four steps and this would then fall under the total assistance category.

Other Points: Not all disability assessment scales require the ability to flush the toilet or clear a bedpan¹⁶. We believe that this should be included in the definition for hygiene reasons.

TRANSFERS

Definition: All aspects of transferring from bed to a chair or wheelchair and back to a bed. This tests several skills including doing first a sit-up from a lying position, a sit to standing position, a weight or pivot shift and a controlled descent to a sitting position in another location.

Practical Points: The heights of the bed and chair are often different and the assessment should score the direction of transfer that comprises the most difficulty. In a hospital, the bed is often higher than the chair and it is more difficult to get back to the bed from a chair. In homes where mattresses are often placed directly on the ground (futon-styled beds) the opposite occurs.

Independence: To transfer from bed to chair and vice versa without the need of a helper. If in a wheelchair, then approaches, locks brakes, removes foot and arm rests and does a transfer often with a sliding board. Regardless, all these are done independently.

Dependence: Minimal assistance means requiring only coaxing, cuing or at most steady assistance to guide the subject to transfer. If the body requires support during transfer, this indicates moderate assistance. If a lot of weight is required to support the body, or if the legs need to be supported as well, this would indicate maximal assistance. Total assistance means that one helper is insufficient to do the transfer or the subject is unable to transfer regardless of assistance.

Other Points: The act of transferring is basic and critical in ADL. Many of the other basic ADLs such as eating, bathing, toileting require an initial act of transfer to a sitting position prior to ADL performance. This importance is recognised in many scales including the BI and its modifications whereby a higher weightage is given to transfers compared to the ADLs¹⁴⁻⁵. In other instruments such as the FIM, there are three

types of transfers including the transfer from bed to chair, transfer to a shower or a bathtub, and transfer to a toilet; and hence the ADL 'transfer' is triple the weightage of other ADLs¹⁶. Transfer from bed to chair or wheelchair is often the most important, common and difficult, and hence this particular transfer forms the definition for this article.

LOCOMOTION

Definition: The act of walking, once in a standing position. If a wheelchair is used for locomotion, assessment commences only from a seated position on a level surface. The distance that is considered significant is controversial (see *other points* below). For this article, we use a distance of eight meters as significant. This would be approximately the end-to-end distance between two HDB apartment rooms, or twice the length of an average size GP clinic.

Practical Points: Record the score with the mode of locomotion that the subject uses most often, either walking or wheelchair. The distance that is considered significant is the same for walking or wheelchair mobility. The discussion that follows applies for both forms of locomotion.

Independence: The ability to walk independently eight meters. This is regardless of walking aid used and the speed of walking. Common walking aids are a cane (single-point stick), quad (four-point) stick, forearm or elbow crutches, axillary crutches, and a walking frame (with or without wheels, the latter termed a rollator frame).

Dependence: Minimal, moderate and maximal assistance, all indicate that the subject is still able to walk eight meters, but a helper needs to assist. Minimal assistance indicates usually contact guarding and gentle guidance to prevent falls. Moderate and maximal assistance imply that the weight of the patient needs to be supported by the helper. The difference is that maximal assistance means supporting the body weight considerably and with difficulty. Total assistance indicates either (1) The patient is unable to walk, (2) The patient cannot cover eight meters regardless of the amount of assistance or (3) Two helpers are required. Points (1) to (3) indicate a very large burden of care.

Other Points: The assessment of walking does not usually include the subcomponent of standing up initially from a seated position. This is more accurately assessed under transfers.

The main issue of debate lies in the distance that needs to be covered to be considered significant. Most authorities divide threshold distances into household ambulation and community ambulation. Household ambulation is the distance required generally to move within the home environment and would plausibly cover the distance between a room and a toilet. This is taken as 50 feet (17 meters) in

the FIM instrument¹⁶⁻⁷. However, the FIM was based on home sizes in the United States which are probably larger. The average 3-room HDB flat (2 bedrooms, 1 kitchen/dining room and a living room) measures about 64 square meters²¹. A reasonable distance for significant household ambulation would then be eight meters.

Community ambulation is the distance required to move for IADL purposes such as grocery shopping or to the nearest bus-stop. This is generally taken as one 'block' in Western societies and measures 50 meters in the modified BI and FIM¹⁴⁻⁷. Fifty meters also seems a reasonable distance in the local context: this is the minimum distance between a pedestrian crossing (for example, traffic lights, overhead bridge or zebra crossing) and a point where we can cross the road without using the pedestrian crossing. However, we use a household ambulation of eight meters as our threshold significant distance because we feel that a large majority of disabled patients are house-bound in Singapore and this more accurately reflects burden of care.

Some patients with significant paralysis of all limbs including patients with high cervical spinal cord injury or multiple sclerosis use a powered or electric wheelchair for mobility. The threshold distances do not change because again, we are measuring the amount of assistance required and not the patient's ability to propel a wheelchair primarily.

REHABILITATION AND ACTIVITIES OF DAILY LIVING

Rehabilitation improves functional outcomes including the performance of ADLs^{4,10}. This improvement in function can occur even after the recovery of the primary disease process is complete. The principles of improving functional capacity in rehabilitation include direct retraining, compensatory processes, and environmental modifications. Recent advances in rehabilitation include more efficient retraining strategies and the realisation that rehabilitation is most effective when a functional approach is employed. The readers are directed elsewhere in this issue for further details on rehabilitation and disability as well as rehabilitation resources available.

EXPERIENCES, STRENGTHS, WEAKNESSES AND CONCLUSIONS

We have published local data on more than 1,500 patients with various diseases in which we have performed disability assessments on during their rehabilitation course⁴. Our experience is that clinicians often overestimate the capabilities of the patients and consequently underestimate the amount of assistance required, and this has been a common experience in many rehabilitation centers¹³. Some care in assessing disability using the guidelines above will overcome this issue. There are also concerns with regards to false self-reporting of disability

among claimants, but because of the high prevalence of disability locally, particularly with evidence of a chronic disease such as stroke or diabetes, it is necessary to apply some common sense for patient beneficence^{3,22}.

All scales or instruments whereby disabilities are measured are subject to several weaknesses, and the assessor in scoring and interpretation should take these into account during test administration. Major weaknesses include:

1. Disability scales are by nature quantitative and ordinal. Categories of disability severity are not equal. For example, on a scale of 1 (most severe) to 10 (least severe), 2 may not be twice as severe as 1, or 3 twice as severe as 2.
2. There is subjectivity in how each disability item should be measured. What constitutes a certain quantum of assistance cannot be perfectly objectively defined. As such, there is continual refinement in the disability assessment literature itself and the focus currently is on refinement of existing scales rather than developing new ones¹³.
3. Content validity. There is no agreement which and how many items need to be included in any disability instrument to provide the optimal representation of disability.
4. Inter-rater reliability. Clinicians who administer disability testing on a regular basis will have better inter-rater reliability versus those who perform testing only occasionally or rarely.

In conclusion, accurate disability assessment of the basic activities of daily living is important as a clinical, research, education and epidemiologic tool. It also functions as a social policy tool for health-care funding, directing rehabilitation resources, as well fulfills an important role in advocating for the disabled in Singapore. Disability assessment requires review over time to maintain relevancy, and long-term goals could be the development and maintenance of a disability database in Singapore.

DISCLAIMER

In this article, we provide a general overview of disability assessment and a possible schema of assessment based on published literature and our experiences in this field. The text will not be applicable to all schemes and policies and the views and opinions expressed are of the authors only.

The ADL definitions and the method in which the severity of disability is categorised vary considerably between the disability-related national schemes and third-party insurers. Similarly, the thresholds and disability category whereby the claimant is successful in obtaining claims also vary significantly between the disability-related national schemes and insurers. The authors will not be held responsible for any disputes that arise in the claims process and the assessor is advised to check with the particular scheme and insurer for details and updates on the assessment process regularly. The authors are currently not affiliated to any disability-related national scheme or third-party insurer.

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