

A Clinicians Guide To The Active Movement Scale (AMS)

*An Evaluative Tool For Infants With Obstetrical Brachial
Plexus Palsy*

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INTRODUCTION

With the inception of the Brachial Plexus Clinic at the Hospital for Sick Children, we realized that a suitable method for evaluating infants with obstetrical palsy was lacking.

We required an assessment tool that could be performed rapidly within a clinic setting and more importantly, one that was sensitive in capturing change in movement (or lack of change) over time. As well, the evaluation system needed to be amenable to statistical applications.

The Active Movement Scale was conceived and adopted in 1990 and to date has been used to record over 7,000 evaluations on almost 1,000 children with obstetrical palsy in our clinic database.

Scientific testing of the Active Movement Scale has demonstrated that it has a high degree of inter-rater reliability between raters with experience using the tool as well as those with little previous use of the scale.

The guidelines within this manual have been developed to introduce clinicians to the Active Movement Scale and to facilitate consistency and reliability between and within evaluations.

It is our hope that work directed towards the evaluation of infants with obstetrical palsy will lead to a greater understanding of this condition and ultimately better management of their care.

ACTIVE MOVEMENT SCALE

Movement Grade	Observation	
0	no muscle tone or contraction	
1	muscle contraction, no motion	
2	joint motion $\leq \frac{1}{2}$ range	gravity eliminated
3	joint motion $> \frac{1}{2}$ range	
4	full joint motion	
5	joint motion $\leq \frac{1}{2}$ range	against gravity
6	joint motion $> \frac{1}{2}$ range	
7	full joint range	

Rules For Assigning Grades:

1. A score of 4 must be achieved (full range of motion with gravity eliminated) before a higher score can be assigned. This clarifies scoring when limited movement is present both with gravity eliminated and against gravity.
2. For consistency and to facilitate observation, $\frac{1}{2}$ joint range is considered:
 - 90° for: shoulder flexion, abduction and adduction
 - elbow flexion and extension
 - shoulder internal and external rotation (when starting from full internal or external rotation)
 - forearm pronation and supination
 - wrist flexion and extension
3. Movement grades are assigned within the available range of passive motion. If a flexion contracture is present at the elbow, for example, full range of extension is scored if the elbow can be extended to the limits of the contracture.
4. Movement is assessed within the age-appropriate range of motion, with the uninvolved contralateral limb used as a control to estimate the extent of available normal range.
5. Extension of the digits is assessed at the metacarpophalangeal joints. Flexion of the digits is evaluated by observing the distance at rest between the finger-tips and the palm and then observing the active motion as a fraction of that distance, both with and without gravity.
6. Digital flexion or extension is given a single grade by using the movement score of the best digit. If the index finger scores a grade of 7 for flexion and the other digits score 2, for example, then the finger flexion score is 7.

AMS Evaluation Form

Movement Grade	Observation	
0	no muscle tone or contraction	
1	muscle contraction, no motion	
2	joint motion \leq 1/2 range	gravity eliminated
3	joint motion $>$ 1/2 range	
4	full joint motion	
5	joint motion \leq 1/2 range	
6	joint motion $>$ 1/2 range	
7	full joint range	

Involved side: R/L

Shoulder Abduction _____

Shoulder Adduction _____

Shoulder Flexion _____

Shoulder External Rotation _____

Shoulder Internal Rotation _____

Elbow Flexion _____

Elbow Extension _____

Forearm Pronation _____

Forearm Supination _____

Wrist Flexion _____

Wrist Extension _____

Finger Flexion _____

Finger Extension _____

Thumb Flexion _____

Thumb Extension _____

AN APPROACH TO ASSESSING INFANTS AND YOUNG CHILDREN

THE ENVIRONMENT

- ideally, a warm and quiet room.
- a mat or clean sheet on the floor
- children undressed to the waist in order to clearly see joint movement and to palpate muscles
- parents nearby – they may hold their infant or toddler if settling the child is difficult
- a variety of age appropriate toys close at hand

ABOUT PLAY

Although a great deal of upper extremity movement can be noted in children simply by observing their play, a more efficient and reliable means of eliciting active movement can be made through a method of controlled facilitation of activity.

This form of play involves very close contact with a child in order to direct and isolate joint movement and in some instances to restrain unwanted movements. The evaluator should feel comfortable sitting with a child on the floor, often with the child directly in the lap. The evaluator should have a specific joint action clearly targeted for observation and should stimulate movement in a purposeful way to elicit the desired response.

Motivation is always the key to eliciting desired movements. Age appropriate toys or even food (if approved by a parent of course) are good motivators.

ASSESSING INFANTS

It is possible to direct and observe the active movement of newborns and infants. In some cases newborns can be assessed entirely in the arms of the observer. A rhythmical, bouncing motion is often helpful in settling fussy babies.

By placing the infant's arm in the correct starting position and then gently stroking the limb segment on the surface towards the desired direction, active movement can be elicited. Sometimes a rattle or a toy that produces noise can be used to draw the baby's attention towards the object. The ability for an infant to attend to a toy is only momentary. A number of objects should be readily available and used freely in order to retain a child's interest.

It must be remembered that newborns do not always demonstrate full, active joint range of motion due to an overriding dominance of physiological flexion. Most typically, shoulder movements are

less than full in the first weeks of life. Examiners should use the contralateral limb as a reference when in doubt of normal range of motion in a newborn.

ASSESSING TODDLERS

The key to the successful assessment of a toddler is the ability of the examiner to secure trust and cooperation before attempting to elicit directed movements. Often a few minutes spent introducing fun or unique toys in a non-threatening way can make a difference in obtaining participation of the child. Ideally the child should reach a point of being comfortable with handling and closeness by the examiner. Sometimes despite ones best effort, a child remains shy or apprehensive. The examiner should proceed however by using the support of the parents in order to complete the assessment to the best of their ability.

Although often the source of challenge, the energy and curiosity of young children can be put to good use in order to direct active movement.

The examiner demonstrates a toy (typically ones that come apart or produce noise) and then encourages the child to reach for the object by presenting it momentarily out of their grasp. The examiner however must be close enough to the child to ensure that only the desired motion is being used to reach for the toy. This may involve positioning or holding the joint in a particular way or restraining movement in the uninvolved arm.

POSITIONING

All 15 functional movements of the Active Movement Scale can be observed by guiding children's play in 3 positions: **supine**, **side-lying** and **sitting**. It is not always necessary to observe active movement in this sequence however novice examiners often prefer to use a fixed approach when first learning to use the AMS.

Supine

A practical sequence of evaluation begins with the child being placed in supine. In this position, gravity eliminated shoulder abduction and adduction can be observed.

**Full movement with gravity eliminated grade 4 must be obtained
before higher scores may be given**

In addition, elbow extension against gravity can be determined (if less than full range is obtained, gravity eliminated extension must be tested in sitting).

Side Lying

Only one movement is tested in this position – gravity eliminated shoulder flexion

Sitting

All remaining gravity eliminated and against gravity movements are tested in sitting. Ideally the child should be sitting with and facing away from the examiner. In this position the child's unaffected arm can easily be immobilized. The examiner reaches above and around the child's arm providing loose restraint with one of their arms. The child's affected arm is then free to direct towards the desired movement.

***PATIENT POSITIONING FOR TESTING 15 FUNCTIONAL
MOVEMENTS USING THE ACTIVE MOVEMENT SCALE***

<u>SUPINE</u>	Gravity Eliminated	Against Gravity	<u>SIDE LYING</u>	Gravity Eliminated	<u>SITTING</u>	Gravity Eliminated	Against Gravity
Shoulder abduction	*		Shoulder flexion	*	Shoulder flexion		*
Shoulder adduction	*				Shoulder abduction		*
Elbow extension		*			Internal rotation		*
					External rotation		*
					Elbow flexion	*	*
					Elbow extension		*
					Pronation	*	*
					Supination	*	*
					Wrist flexion	*	*
					Wrist extension	*	*
					Finger flexion	*	*
					Finger extension	*	*
					Thumb flexion	*	*
					Thumb extension	*	*

GRADING ACTIVE MOVEMENT

SHOULDER

Abduction:

Gravity eliminated (supine)

- start with arm adducted
- stimulate movement in a sideways direction
- score less than 4 if movement is not full
- test against gravity if full

Against gravity (sitting)

- stimulate sideways movement of arm – internal rotation may need to be inhibited

Adduction:

Gravity eliminated (supine)

- start with arm fully abducted
- stimulate child's trunk to elicit shoulder adduction
- score less than 4 if movement is not full

Against gravity (supine)* modified position

- unsafe to suspend child to test movement against gravity therefore apply resistance to child's fully adducted arm to determine if additional power is present
- if additional power is detected, the movement is scored 7

Flexion:

Gravity eliminated (side-lying)

- affected arm is placed on the lateral aspect of the child's chest
- movement is stimulated in a forward direction
- the examiner should use one hand to gently restrain elevation and internal rotation of the shoulder – a movement that can mimic forward flexion

Against gravity (sitting)

- stimulate movement in a forward and upward direction

SHOULDER

Internal/External Rotation:

Gravity eliminated (sitting)

- the child's upper arm is at the side - the examiner flexes the elbow to 90° using their thumb and index finger
- movement is stimulated by encouraging the child to move their hand in an outward or inward direction
- movement is observed in relation to the position of the forearm against the chest

- * - extension of the elbow can mimic the appearance of external rotation of the shoulder – care must be taken to ensure that the elbow remains in 90° of flexion

SHOULDER (Continued)

Internal/External Rotation:

Against gravity (sitting)* modified position

- the child's arm is positioned as above
- if full movement with gravity eliminated has been demonstrated (grade 4), resistance is applied to determine if additional power is present
- a score of 7 is given if resistance is noted

ELBOW

Flexion:

Gravity eliminated (sitting)

- the child's shoulder is abducted to 90°
- the fingers of the examiners suspending hand should be palpating the biceps muscle
- stimulation of movement should be directed towards elbow flexion

Against gravity (sitting)

- the child's arm is at the side
- the examiner restrains the upper arm in an adducted position
- elbow flexion is stimulated while restraining upper arm abduction

Extension:

Gravity eliminated (sitting)

- the child's shoulder is forwardly flexed 90° and the elbow is fully flexed
- movement is stimulated in the direction of elbow extension

Against gravity (supine)

- the child's shoulder is forwardly flexed 90° with the elbow fully flexed
- movement is stimulated in the direction of elbow extension

FOREARM

Pronation/Supination:

Gravity eliminated (sitting)

- the child's shoulder and elbow are held in 90° of flexion
- the child's hand is stimulated in the directions of pronation and supination
- movement is observed at the level of the lower forearm - not the wrist

Against gravity (sitting)

- the child is positioned with the upper arm adducted and the elbow flexed to 90°
- to test pronation, the forearm is fully supinated and movement of the hand is directed towards full pronation

- supination is tested in opposite way with the forearm being fully pronated and
- the hand is stimulated towards full supination

WRIST

Flexion/Extension:

Gravity eliminated (sitting)

- the child's elbow is flexed to 90° with the forearm in neutral
- wrist flexion and extension are stimulated by presenting objects to the palmar and dorsal sides of the hand

Against gravity (sitting)

- wrist flexion is tested with the forearm fully supinated and the wrist extended – stimulation to the palm of the hand is used to draw the hand towards flexion
- wrist extension is tested with the forearm fully pronated and the wrist flexed – stimulation to the dorsum of the hand is used to draw the hand towards extension

FINGER

Flexion/Extension:

Gravity eliminated (sitting)

- the child's elbow is flexed to 90° with the forearm in neutral
- the wrist may be stabilized in neutral
- finger flexion is stimulated by presenting thin objects into the palm of the hand – grades are assigned as a fraction of movement from the fingertips to the palm
- finger extension is elicited by stimulating the back of the hand and fingers – grades are assigned from movement observed at the metacarpo-phalangeal joints

Against gravity (sitting)

- finger flexion is tested with the forearm fully supinated and the wrist held in neutral – grades are assigned as a fraction of movement from the fingertips to the palm
- finger extension is tested with the forearm fully pronated and the wrist held in neutral – grades are assigned from movement observed at the metacarpo-phalangeal joints

THUMB

Flexion/Extension:

Gravity eliminated (sitting)

- the child's elbow is flexed to 90° with the forearm supinated
- the wrist may be stabilized in neutral
- thumb flexion is directed towards the base of the 5th digit and movement is measured as a fraction of the distance from the tip of the thumb to the base of the 5th digit
- thumb extension is elicited by stimulating the thumb away from the palm and is measured at the thumb metacarpo-phalangeal joint

Against gravity (sitting)

- thumb flexion is measured in the same manner as in the gravity eliminated position – slight resistance can be applied to determine if additional power is present when gravity eliminated movement is full – a score of 7 is then given when power is demonstrated

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THUMB (Continued)

Flexion/Extension:

- thumb extension is measured with the child's elbow flexed to 90° and the forearm in a neutral position – stimulation to the dorsum of the thumb is used to elicit extension – movement is measured at the metacarpophalangeal joint

REFERENCES

1. Curtis CG, Stephens D, Clarke HM, Andrews D. The Active Movement Scale: An Evaluative Tool for Infants With Obstetrical Brachial Plexus Palsy. *J Hand Surg* 2002; 27A:470-478
2. Clarke HM, Curtis CG. An Approach To Obstetrical Brachial Plexus Injuries. *Hand Clin* 1995; 11:563-581