Goal attainment scaling in easy stages

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Objectives

- **Essential Background**
  - What is goal attainment scaling?
  - Why might we want to use it?

- **How to do it**
  - In easy stages
    - What the clinicians needs to know
    - Further steps for research purposes only
Essential background
**Outcome measurement 1**

- **Standardised measures (eg FIM / Barthel Index)**
  - Standard set of items/tasks
  - Scored on standard levels

- **A useful yardstick**
  - To compare different populations
  - Or to measure change from baseline

- **Often disappointing indicator of outcome**
  - Fail to reflect the actual aims of treatment
    - Or benefits that are important to the patient
  - Insensitive
    - If many items are unchanged
Useful standard yardstick
S-shaped curve

Standard measure

100

0

Time

Gain

LOS

A

B
Floor and ceiling effects

Standard measure

100

0

Time

Gain

LOS

A

B
Problems

- Population diversity
  - Different levels of functioning
  - Different potential for recovery
  - Different goals for rehabilitation

- Focal interventions
  - Small changes lost in the ‘noise’ of global scales

- Therapist-led scoring
  - Objective, but not necessarily user-focused
Alternatives

- Achievement of individual goals
  - Person-centred approach
    - Record what matters to the individual patient
  - Flexible
    - Tailored to the individual’s ability
  - Sensitive
    - Specifically reflect aims of treatment

- But
  - Difficult to compare populations
  - How to assimilate several goals
    - Into one overall score?
What is goal attainment scaling?

- A method of scoring
  - Extent to which goals are achieved
  - In a standardised way
  - Goals combined to a single GAS T-score
  - Reflecting achievement of expected goals

- GAS T score (Advanced stage)
  - Provides basis for comparison
  - That allows for individual differences
Why use GAS?

◆ Person-centred perspective
  ➢ It measures what matters to the patient
  ➢ Provides two types of information
    ➢ Quantitative
      ➢ Assessment of success
    ➢ Qualitative
      ➢ What the patient wanted to achieve

◆ It reflects the intentions of treatment
  ➢ What we aimed to achieve

◆ Provides a more sensitive measure
  ➢ Does not include irrelevant items
GAS is conceptually different

- Not a measure of function
  - Measures achievement of expectation
- Depends on two things
  - Individual’s ability to change
  - Teams ability to predict outcome
    - Requires experience and knowledge
- It is reasonable to expect
  - That clinicians offering treatment
    - Have some idea of the likely outcome
      - In order to weigh up benefit vs harm of the intervention
- GAS does not replace standardised measures
Goal attainment scaling made easy
Easy stages

- **Stage 1**
  - Goal setting

- **Stage 2**
  - Rating goal achievement

- **Stage 3**
  - Weighting for importance

- **Stage 4**
  - The GAS formula

- **Stage 5**
  - Using GAS for research
    - Follow-up guides

All that clinicians need to know

Optional

For geeks and researchers only!
Stage 1: Goal setting
Terminology

Admission
Discharge

Staged ‘goals’

Short-term goals
Medium-term goals
Objective

Rehab

Long-term goals

Aim

Life beyond

Time

Strictly-speaking – ‘Objective attainment scaling’ (OAS)
Goal setting – a critical step

- Discuss and agree
  - With patient / family
  - With multidisciplinary Team

- Expected outcomes for treatment
  - If expectations unrealistic
    - Negotiate what can reasonably be achieved
  - Is the expected outcome worthwhile?

- Describe and document expected outcome
  - Ensure that this is understood and agreed.
Common goals in Rehabilitation

- Reducing impairment
- Mobility, dexterity
- Passive function
  - reducing care needs
- Activities
  - independence in ADL/ EADL
- Symptom relief
  - pain, depression
- Communication
- Cognitive / psychosocial function
- Managed discharge

GAS could include any of all of these
- Pt’s goals
- Family’s goals
- Therapists goals
Defining the goals

- Rehab goals must be SMART
  - Specific
  - Measurable
  - Achievable
  - Realistic
  - Timed

Patient says: - “I want to be able to use my arm normally”
Rehab team: must develop a SMART equivalent
Example

- Jane
  - “I want to be able to get dressed more easily”

- SMART
  - To reduce the spasticity in Jane’s arm
    - So she can put her arm into the sleeve of her jacket
    - Without help from another person
    - By [specified date]
How many goals?

◆ There is no set number of goals
  ➢ Can vary from patient to patient

◆ BUT - goal definition / negotiation
  ➢ Can be time-consuming

◆ For practical purpose
  ➢ Set nor more than 3-5 goals
    (3 is plenty in most cases)
    ➢ 1 primary goal
    ➢ 2-3 secondary goals
Stage 2: Rating goal attainment
GAS – 5-point scale

- Score 0
  “The most probable level achieved if the pt receives the expected treatment”

<table>
<thead>
<tr>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot less</td>
<td>A bit less</td>
<td>Expected Outcome</td>
<td>A bit more</td>
<td>A lot more</td>
</tr>
</tbody>
</table>

- Weighting is optional
Baseline scores

- Baseline rating
  - Usually -1
    - To allow for possibility of deterioration
  - Unless no worse condition is clinically plausible – for example
    - pain 10/10 - or as bad as it could be
    - Unable to do task at all
  - If could not be worse
    - score -2 at baseline
Rating goal attainment

Was the goal achieved?

Yes

Better than expected

Achieved as expected

Score

A lot +2
A little +1
0

No

Less than expected

A little -1
A lot -2
Some clinicians

- Prefer not to use numbers
- Think in terms of:
  - Achieved
  - Partially achieved
  - No change

The following verbal tree

- Provides all the information required
- To assign scores retrospectively
  - Without forcing numbers on clinicians
Baseline level

Some function

Baseline rating

Unable to do task
Or as bad as they could be:
Eg pain score 10/10

Base line level
With respect to that goal

-1

-2
Alternative (verbal rating)

Was the goal achieved?

Yes
- **A lot** better than expected
- **A little** better than expected
- **Achieved** as expected

No
- Partially achieved
- The same
- **Worse**
Using GAS to negotiate

- “I want to use my hand normally”

<table>
<thead>
<tr>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unable to use hand at all</td>
<td>Requires help to get hand around cup, unable to hold cup upright.</td>
<td>Use hand to grasp and stabilise cup whilst pouring a drink</td>
<td>Use hand to lift cup to mouth and drink</td>
<td>Using hand normally</td>
</tr>
</tbody>
</table>
## Score allocation

<table>
<thead>
<tr>
<th>Was the goal achieved?</th>
<th>Depends on baseline score:</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2</td>
</tr>
<tr>
<td>Yes</td>
<td>A lot more</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>A little more</td>
<td>+1</td>
</tr>
<tr>
<td></td>
<td>As expected</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Partially achieved</td>
<td>(-1)</td>
</tr>
<tr>
<td>No</td>
<td>Same as baseline</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>Worse</td>
<td>-2</td>
</tr>
</tbody>
</table>
Stage 3:
Goal weighting (optional)
Goal weighting

◆ Some goals
  - Matter more to the patient than others
  - Present more of a challenge than others

◆ To take these factors into account
  - Goals can be weighted for
    - Importance
      - to the patient/family
    - Difficulty
      - rated by the team
Weighting scale

<table>
<thead>
<tr>
<th>Importance</th>
<th>Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>(for Patient / family)</td>
<td>(rated by Team)</td>
</tr>
<tr>
<td>Not at all</td>
<td>Not at all</td>
</tr>
<tr>
<td>A little</td>
<td>A little</td>
</tr>
<tr>
<td>Moderately</td>
<td>Moderately</td>
</tr>
<tr>
<td>Very</td>
<td>Very</td>
</tr>
<tr>
<td>Not at all</td>
<td>0</td>
</tr>
<tr>
<td>A little</td>
<td>1</td>
</tr>
<tr>
<td>Moderately</td>
<td>2</td>
</tr>
<tr>
<td>Very</td>
<td>3</td>
</tr>
</tbody>
</table>

Weight = Importance x Difficulty
A 54-year-old lady
- with post-stroke spasticity
- Is treated with botulinum toxin

Goals for treatment
- To reduce her shoulder pain
  - From pain score 7/10 (currently) to 4/10
- To make dressing easier
  - To get her arm through the sleeve of her jacket with only incidental help
- To make it easier to maintain axillary hygiene
  - Improve carer rating of ‘ease of cleaning under arm from 4/10 (currently) to 6-7/10
Taking this example

Applying weighting, baseline and outcome scores:

<table>
<thead>
<tr>
<th>Goals</th>
<th>Importance</th>
<th>Difficulty</th>
<th>Baseline Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce pain to 4/10</td>
<td>3</td>
<td>3</td>
<td>-1</td>
</tr>
<tr>
<td>Get arm through jacket sleeve with minimal help</td>
<td>2</td>
<td>3</td>
<td>-1</td>
</tr>
<tr>
<td>Easier to clean under arm</td>
<td>2</td>
<td>2</td>
<td>-1</td>
</tr>
</tbody>
</table>

Baseline GAS = 36.6
Taking this example

Applying weighting, baseline and outcome scores:

<table>
<thead>
<tr>
<th>Goals</th>
<th>Importance</th>
<th>Difficulty</th>
<th>Baseline Score</th>
<th>Outcome Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce pain to 4/10</td>
<td>3</td>
<td>3</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Get arm through jacket sleeve with minimal help</td>
<td>2</td>
<td>3</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Easier to clean under arm</td>
<td>2</td>
<td>2</td>
<td>-1</td>
<td>+1</td>
</tr>
</tbody>
</table>

Baseline GAS = 36.6  Achieved GAS T score = 48.6
Demo GAS calculation sheet
Interpreting GAS T scores

- If all goals achieved as expected
  - GAS T-score will be 50

<table>
<thead>
<tr>
<th>If the patient does:</th>
<th>Expected range for GAS T scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better than expected</td>
<td>50-60</td>
</tr>
<tr>
<td>Much better than expected</td>
<td>&gt;60</td>
</tr>
<tr>
<td>Less well than expected</td>
<td>40-50</td>
</tr>
<tr>
<td>Much less than expected</td>
<td>&lt;40</td>
</tr>
</tbody>
</table>
EASY!

Clinicians need go no further

(GAS scores can be calculated using a simple spreadsheet)
Stage 4: Applying the formula

For those curious to understand how the formula works
Step 1

- If used verbal rating
  - Allocate scores to each goal

- Achievement rating
  - Depends on baseline score
    - Rate goal achievement
    - According to the following table
### Score allocation

<table>
<thead>
<tr>
<th>Was the goal achieved?</th>
<th>Depends on baseline score:</th>
<th>Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A lot more</td>
<td>+2</td>
</tr>
<tr>
<td></td>
<td>A little more</td>
<td>+1</td>
</tr>
<tr>
<td><strong>As expected</strong></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Partially achieved</td>
<td>(-1)</td>
</tr>
<tr>
<td></td>
<td>Same as baseline</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>Worse</td>
<td>-2</td>
</tr>
</tbody>
</table>

The table above outlines the score allocation for different scenarios based on whether the goal was achieved and the baseline score. The goal achievement is categorized into 'Yes' and 'No', with respective subcategories for 'As expected', 'A lot more', 'A little more', 'Partially achieved', and 'Same as baseline'. The baseline score is adjusted accordingly for each scenario. For example, if the baseline score is 'Baseline -1', a 'Yes' for 'As expected' results in a score of 0, while a 'No' for 'Same as baseline' results in a score of -2.
What does the formula do?

- **Calculates a GAS T-Score:**
  - **The composite GAS score**
    - (ie the sum of attainment levels x relative weights for each goal)
  - **Is transformed to a standardised measure**
    - Mean 50 and Std Dev ± 10

- If results exceed and fall short of expectations equally
  - **GAS T-scores form a normal distribution**
  - **Allow statistical analysis**
    - Using parametric techniques
Distribution of GAS T scores

Normal distribution
Mean = 50
SD ±10
What is the GAS formula?

\[ = 50 + \frac{10 \sum (w_i x_i)}{\left[(1 - \rho) \sum w_i^2 + \rho \left( \sum (w_i)^2 \right)^2 \right]^{1/2}} \]

**Where**

- \( w_i \) = the weight assigned to the \( i \)th goal
- \( x_i \) = the numerical value achieved (between \(-2\) and \(+2\))
- \( \rho \) = the expected correlation of the goal scales (normally \(0.3\))

- If weights are equal, \( w_i = 1 \)
Simplifies to:

\[ = 50 + \frac{10 \sum (w_i x_i)}{\sqrt{(0.7 \sum w_i^2 + 0.3(\sum w_i)^2)}} \]

- Hence the Mean 50 and Std Dev ± 10

- NB This formula only works
- Where Goal achievement scored on a scale Centred around 0
- Cannot be applied for Alternatives such as

<table>
<thead>
<tr>
<th></th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Worse</td>
<td>No change</td>
<td>Partially achieved</td>
<td>Achieved</td>
</tr>
</tbody>
</table>
How do we apply the formula

- To calculate GAS
  - Look up in tables
  - Spreadsheet calculator

- Or, if you really want to...
  - Follow the worked example
54-year-old lady with post-stroke spasticity
Treatment with botulinum toxin

<table>
<thead>
<tr>
<th>Goals</th>
<th>Importance</th>
<th>Difficulty</th>
<th>Baseline Score</th>
<th>Outcome Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce pain to 4/10</td>
<td>3</td>
<td>3</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Get arm through jacket sleeve with minimal help</td>
<td>2</td>
<td>3</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Easier to clean under arm</td>
<td>2</td>
<td>2</td>
<td>-1</td>
<td>+1</td>
</tr>
</tbody>
</table>

Baseline GAS = 36.6  Achieved GAS T score = 48.6
\[
= 50 + \sqrt{\frac{10 \sum (w_i x_i)}{(0.7 \sum w_i^2 + 0.3(\sum w_i)^2)}}
\]
\[
\sqrt{(0.7 \times (81 + 36 + 16) + 0.3 \times (19)^2)}
\]
\[
\sqrt{(0.7 \times 133) + (0.3 \times 361)}
\]
\[
\sqrt{93.1 + 108.3}
\]
\[
\sqrt{201.4}
\]

<table>
<thead>
<tr>
<th>Goal</th>
<th>Importance</th>
<th>Difficulty</th>
<th>Weight</th>
<th>Baseline</th>
<th>Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Dressing</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>Hygiene</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>-1</td>
<td>+1</td>
</tr>
</tbody>
</table>

**GAS scores**

**Baseline**

Sum (w x score) = -19

(x10): \(-190\) = -13.4

14.2

(Plus 50): \((50 - 13.4) = 36.6\)

**Outcome**

Sum (w x score) = -2

(x10): \(-20\) = -1.4

14.2

(Plus 50): \(50 -1.4 = 48.6\)

Change = 12
Alternatively

◆ To calculate without weights
  ➢ Apply formula
  ➢ With all weights = 1

◆ Small difference to calculation
  ➢ But not much
  ➢ The main value of goal weights
    ➢ Is in the qualitative interpretation
\[
= 50 + \sqrt{10 \Sigma (w_i x_i)}
\]
\[
= 50 + \sqrt{(0.7 \Sigma w_i^2 + 0.3(\Sigma w_i)^2)}
\]
\[
= 50 + \sqrt{(0.7 \times (1+1+1) + 0.3 \times (3)^2)}
\]
\[
= 50 + \sqrt{(0.7 \times 3) + (0.3 \times 9)}
\]
\[
= 50 + \sqrt{2.1 + 2.7}
\]
\[
= 50 + \sqrt{4.8}
\]
\[
= 50 + 2.2
\]

GAS scores

Baseline
Sum (w x score) = -3
(x10): \(-30 = -13.6\)
(Plus 50): 50 - 13.6 = 36.4

Outcome:
Sum (w x score) = 0
(x10): \(0 = 0\)
(Plus 50): 50 + 0 = 50

Change = 13.6
Stage 5: using GAS for Research
Problems with GAS

◆ Critics claim
  ➢ GAS is too subjective

◆ To make it more robust
  ➢ Originators recommend
    ➢ Using follow-up guide
      ➢ Pre-define levels for each rating
### Example of follow-up guide

<table>
<thead>
<tr>
<th>Pain levels (Rated out of 10)</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get arm through jacket sleeve</td>
<td>&gt;8/10</td>
<td>5-8/10</td>
<td>4/10</td>
<td>1-3/10</td>
<td>Pain free</td>
</tr>
<tr>
<td>Easier to clean under arm (rated by carer)</td>
<td>Carer rating of ease = 1-2/10</td>
<td>Carer rating of ease = 3-5/10</td>
<td>Carer rating of ease = 6-7/10</td>
<td>Carer rating of ease = 8-9/10</td>
<td>Able to manage without help</td>
</tr>
</tbody>
</table>

- **Pain levels**
  - **-2**: Requires help throughout the task
  - **-1**: Minimal help required (incidental only)
  - **0**: Achieves without help but takes extra time (> 5 minutes)
  - **+1**: Achieves without help in timely manner (<5 minutes)
  - **+2**: Pain free

- **Get arm through jacket sleeve**
  - **Unable to get arm through sleeve**
  - **Requires help throughout task**

- **Easier to clean under arm**
  - **Carer rating of ease**
    - **-2**: Carer rating of ease = 1-2/10
    - **-1**: Carer rating of ease = 3-5/10
    - **0**: Carer rating of ease = 6-7/10
    - **+1**: Carer rating of ease = 8-9/10
    - **+2**: Able to manage without help
Pros and cons

◆ Advantages of follow-up guide
  - A priori goal setting
  - Less subjective
    - Theoretically improved reliability
  - Required gold standard
    - For research purposes

◆ Disadvantages
  - Very time consuming
    - Not practical for routine clinical use
Statistical Analysis

◆ GAS formula designed to give
  ➢ Continuous data
  ➢ Normally distributed
    ➢ Mean = 50, SD 10
  ➢ Allow use of parametric statistics

◆ Critics argue
  ➢ Goal scores are still ordinal
    ➢ Should use non-parametric methods

◆ No hard rule
  ➢ In practice both give fairly similar results
GAS without tears

- Build GAS into clinical thinking
  - Decision-making
  - Outcome evaluation
- Part of routine practice
6 key steps

- Identify Presenting problems
- Are they amenable to treatment?
- Identify broad goal areas
- Define SMART goals
- Evaluate goal achievement
- Patient
- With what Intervention?
- Are they worthwhile?
- 1 primary 2-3 secondary Goals
- GAS
WHO ICF (International classification of functioning, disability and health)

Health condition
Disorder or disease

Body structures and functions (Impairment)

Activity (Disability)

Participation (Handicap)

Environmental factors

Personal factors

Contextual factors

(Pathology Diagnosis)
## Mapping goals onto ICF

<table>
<thead>
<tr>
<th>Goal area</th>
<th>Task</th>
<th>ICF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impairment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain relief</td>
<td>Pain</td>
<td>b280</td>
</tr>
<tr>
<td>Passive movement</td>
<td>Maintaining joint range</td>
<td>b735, b710</td>
</tr>
<tr>
<td><strong>Activities / participation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td>Walking / gait</td>
<td>d450</td>
</tr>
<tr>
<td>Dexterity</td>
<td>Fine hand use</td>
<td>d440</td>
</tr>
<tr>
<td>Self care</td>
<td>General independence</td>
<td>d500</td>
</tr>
<tr>
<td>Dressing</td>
<td></td>
<td>d540</td>
</tr>
<tr>
<td>Eating / drinking</td>
<td></td>
<td>d550, d560</td>
</tr>
<tr>
<td>Domestic</td>
<td>Cooking</td>
<td>d630</td>
</tr>
<tr>
<td></td>
<td>Household tasks</td>
<td>d640</td>
</tr>
<tr>
<td>Recreation</td>
<td>Leisure / hobbies</td>
<td>d920</td>
</tr>
</tbody>
</table>