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## **Development and initial testing of a Health Confidence Score (HCS)**

Tim Benson<sup>1,2</sup>, Henry WW Potts<sup>2</sup>, Pippa Bark<sup>2</sup>, Clive Bowman<sup>3</sup>

<sup>1</sup> R-Outcomes Ltd, <sup>2</sup> UCL Institute of Health Informatics, <sup>3</sup> City University of London School of Health Sciences

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For further information please contact:

*Tim Benson*

*R-Outcomes Ltd*

*tim.benson@r-outcomes.com*

*Tel: +44 7855 682037*

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## **ABSTRACT**

### **Introduction**

Understanding how confident patients are in looking after their own health is essential to improve patient outcomes and clinical support. With few suitable tools available to measure self-care health confidence, we developed and validated a short, generic survey instrument.

### **Methods**

The Health Confidence Score (HCS) was developed through literature review, patient and expert focus groups and discussions, before being further validated over a 3-year period.

This report covers results of two studies testing construct and concurrent validity: an online survey (n=1031, study1), and a face-to-face survey (n=378, study2). Scores were correlated against the My Health Confidence (MHC) rating scale, howRu (health status) and relevant demographics.

### **Results**

The Health Confidence Score is short (50 words) with good readability (reading age 8). Items are reported independently and as a summary score. The HCS has four items covering health knowledge, ability to self-manage, access to help and shared decision-making, each having four response options.

In study2, the mean summary score was 76.7 (SD 20.4) on 0-100 scale. Cronbach's alpha = 0.82. Exploratory factor analysis suggests that the four items relate to a single dimension. Correlation of the HCS summary score with MHC was high (Spearman  $r=0.76$ ). It was also associated with health status (Spearman  $r=0.49$ ), but negatively with number of medications taken ( $r=-0.29$ ) and age ( $r=-0.22$ ). It was not associated significantly with ethnicity, having children or education level.

### **Conclusions**

The Health Confidence Score is short, easy to use, with good psychometric properties and construct validity. The summary score gives an overall picture of confidence and each item is meaningful independently. It can be integrated into electronic records.

## INTRODUCTION

Understanding how confident patients are in looking after their own health is vital to improve patient outcomes and clinical support. With rising demands on the health service, increasing patient self-care is a key policy focus.[1] The NHS has a commitment to “give citizens the knowledge, skills and confidence to manage their own health”. [2] This is a response to patients wish for more involvement in their own care[3] and financial strains.[4]

Those who are more engaged in their own health report better outcomes.[5] Interventions, which improve participants’ self-rated confidence to comply with prescriptions and maintain lifestyle changes, have been shown to be effective[6,7] in diabetes,[8] depression and heart disease.[9] However, 25% - 50% of the patient population have low levels of health confidence,[10,11] which negatively impacts outcomes and experience, and increases use of emergency care. When health confidence is high, patients take more exercise, eat more healthily and avoid risks; people with diabetes report better blood sugar control. Health confidence is also positively associated with patient’s knowledge (health literacy) and ability to access care they need.[12,13]

Measures of patient involvement cover a wide domain [14], including patient-centred care [15], self-care education [16] and patient activation [17] and interactive health communication.[18]

We could find few short measures suitable for routine use that are targeted specifically at measurement of self-care confidence, other than My Health Confidence.[19] This has two questions answered on an 11-point scale: (1) *how confident are you that you can control and manage most of your health problems*, and (2) *how understandable and useful is the information your doctors and nurses have given you about your health problems or concerns*.

We identified a need for a brief, broad measure of patients’ own perception of their confidence to self-care, covering health literacy and knowledge, ability to self-manage, to obtain help and involvement in shared decisions. This Health Confidence Score (HCS) would be useful both at the individual level to increase awareness of gaps in an individual's confidence, and at the aggregate level for evaluation, audit, quality improvement, operational management and commissioning, and for use in combination with other measures.

## METHODS

### Development

The HCS design criteria were to be clear, short, with a low reading age, generic (applicable to people with any condition), suitable for frequent use, responsive, and with good psychometric properties; also, to generate scores that are easy to understand and action, and comparable for benchmarking. These criteria are common to all PROMs intended for clinical use.[20,21]

Development of the HCS questionnaire followed a similar process to that used in previous patient-reported measures for health status (howRu),[22] patient experience (howRwe),[23] and personal well-being (PWS).[24] A literature review was combined with informal discussions and focus groups with patients and experts.

## *Literature review*

A literature review was informed by published reviews,[5,25,26] and by measures used to capture self-efficacy,[27] health literacy,[28,29] patient activation,[17,30] patient engagement,[19,31] shared decision-making [32] and capability.[33]

## *Patient and expert discussion*

Informal focus groups and discussions with patients and clinicians in general practice and community services during 2014-2016. The aim was to synthesise the core domains of interest derived from the literature and to create statements to capture these in a generic way.

Four domains were identified:

- *Knowledge* – how much you understand about your health and treatment; this covers aspects of health literacy.
- *Self-management* – perceived ability to manage your health, treatment and lifestyle.
- *Access to help* – your social proficiency to navigate the health and care system to obtain services you need.
- *Shared decision-making* – your participation in clinical decisions and how well staff understand your wishes.

## **Length and Readability**

Response rates and data quality are impacted by questionnaire length and complexity.[34] The number of items and words in the HCS was compared with six other instruments that measure related constructs: My Health Confidence (MHC),[19] Patient Health Engagement Scale (PHE-s),[31] Stanford self-efficacy for managing chronic disease 6-item scale,[35] Patient Activation Measure (PAM-13),[36] ICECAP-A,[33] and the Health Literacy Questionnaire (HLQ).[37] The texts analysed are those reported by the original authors.

Reading age was measured with the Flesch-Kincaid Readability Grade (FKG), provided in Microsoft Word.[38] In general, patients should not be asked to complete questionnaires with reading age more than ten, corresponding approximately to FKG=5.[39]

## **Validation Studies**

Two studies are reported here.

### *Online Validation Study 1*

Study 1 tested the Stage 1 questionnaire and was conducted in March 2015 through YouGov using a nationally representative online sample in the UK, as part of a study on online cancer information.[40] Panel members were paid a small fee for surveys completed. The four HCS questions were presented on screen (without graphics) early in the survey.

### *Study 2*

Study 2 tested the Stage 2 questionnaire. During the summer of 2015, an interviewer approached a convenience sample of members of the public around Newbury, an English market town, and asked them, with their consent, to complete a short anonymous survey, presented on a two-sided laminated sheet. The interviewer entered responses into a web-based survey app using a smart-phone.

In addition to the HCS, each respondent was asked to complete the MHC survey,[19] and the *howRu* health status measure.[22] *HowRu* has four items: (1) Pain or discomfort, (2) Feeling low or worried, (3) Limited in what you can do, and (4) Require help from others; each item has four responses: None, A little, Quite a lot, and Extreme.

We also recorded respondent's gender, age in decades, ethnicity (White British or other), if they had children (yes or no), took regular medication (none, 1 or 2, 3 or more medications each day), and age at which they completed education (under 17, 17-19, over 19).

### ***Expected Results***

*Distribution:* In Study 2 we hoped to find a broader distribution of responses than in Study 1. We expected a ceiling effect, but despite having no *strongly disagree* response option, did not anticipate a floor effect.

*Internal consistency:* We expected inter-item correlations in the range  $r = 0.4$  to  $0.6$  and Cronbach's alpha between  $0.7$  to  $0.9$ , which would justify the use of a summary score.[41]

*Factor analysis:* Exploratory factor analysis, using the JASP statistics program, was applied to the whole data set (using an oblique rotation, Promax, as we expected constructs to be correlated) for the individual questions in HCS, *howRu*, and the two MHC questions.

*Construct validity* is the degree to which the scores of an instrument are consistent with hypotheses, such as relationships to scores of other instruments or differences between relevant groups, based on the assumption that the instrument validly measures the construct to be measured.[42]

We hypothesised that in a study of this size:

- Health confidence would be moderately associated with health status, as measured by *howRu*.
- There would be little difference in health confidence between men and women, being a parent, education and ethnicity.
- Health confidence would be lower in people taking more medication.

We expected HCS to correlate more strongly with the MHC Confidence scale, than with the MHC Information scale.

### **Ethics Statement**

Research ethics approval was not sought because both studies used data collected anonymously from members of the public who consented freely to complete the task. No data was collected unless participants consented. There was no risk of substantial damage or distress to individual participants.[43]

## RESULTS

### Development

The development of the measure took place in two stages.

#### *Stage 1 Development*

The Stage 1 questionnaire evolved through more than 30 distinct iterations over several months, with small-scale testing and refinement. Initially, we proposed to use the question *how confident do you feel?* with four response options: *very confident, quite confident, not very confident, and not at all confident.*

However, in testing (see Results), we found that the distribution of scores in Study 1 was narrower than hoped.

#### *Stage 2 Development*

Consequently, we recast the questionnaire into an agree-disagree format and the wording evolved through 30 further iterations. The final questionnaire is shown in Figure 1.

The four items are:

1. I know enough about my health (short term: knowledge)
2. I can look after my health (short term: self-management)
3. I can get the right help if I need it (short term: access)
4. I am involved in decisions about me (short term: shared decision-making)

We used four response options, recognizing the skewed nature of the expected distribution: *Strongly agree, Agree, Neutral* (the version used in Study 2 had *neither agree nor disagree*), and *Disagree*. All responses are optional, there is no *Don't know* category. The combination of four items and four options creates a 4×4 matrix with 256 combinations.

For analysis, each option is allocated a score on a 0 to 3 scale, where: *Strongly agree* = 3, *Agree* = 2, *Neutral* = 1, and *Disagree* = 0. Higher is better. A summary score is calculated by adding the scores for each item, giving a 13-point scale with a range from 0 (4 × *disagree*) to 12 (4 × *strongly agree*).

For reporting group results, the mean scores are transformed linearly to a scale from 0 to 100, where 0 indicates that all respondents chose the lowest score and 100 that all chose the highest. A common 0-100 scale is familiar and lets people compare item and summary mean scores on the same scale.

The UK Terminology Centre has issued SNOMED CT and Read Codes for the HCS so that the information can be recorded in the patient's electronic health record (EHR).[44]

**Health Confidence**

How do you feel about caring for your health?  
How much do you agree?

Strongly agree    Agree    Neutral    Disagree

I know enough about my health

   

I can look after my health

   

I can get the right help if I need it

   

I am involved in decisions about me

   

Figure 1 Health Confidence Score (HCS)

### Length and Readability

The number of items (questions), words, FKG and reading age for the final HCS and other instruments are shown in Table 1. The HCS has the lowest word count and reading age.

Table 1: Number of items, words, Flesch-Kincaid Grade (FKG) and reading age of questionnaires

Instrument	No of items	Word count	FKG	Reading age
Health Confidence Score (HCS)	4	50	2.8	8
Health Literacy Questionnaire (HLQ)	44	1,001	7.2	12
ICECAP-A	5	281	5.2	10
My Health Confidence (MHC)	2	83	4.8	10
Patient Activation Measure (PAM-13)	13	299	8.2	13
Patient Health Engagement Scale (PHE-s)	5	144	5.1	10
Stanford self-efficacy for managing chronic disease 6-item scale	6	212	8.5	14

## Study 1 Distribution

Study 1 (using the Stage 1 questionnaire) had 1,031 responses. The score distribution was narrower than hoped for, with mean summary score 8.0 on the 0-12 scale, standard deviation 2.0, range 0 - 12, interquartile range 7 - 9, negative skew -0.5 and kurtosis 1.1. 62% chose the same response (*quite confident*). This led to revision of the instrument (Stage 2).

## Study 2 Results

Study 2 used the final questionnaire. 381 people completed the survey. Five surveys (1.3%) contain any missing values for any item. At each level, only complete data sets were analysed.

The frequency distribution of each item is shown in Table 2. Frequency varies from 1% (*disagree that I can get the right help if I need it*) to 53% (*strongly agree that I am involved in decisions about me*).

Table 2: Frequency distributions for the questionnaire items in Study 2 (n=378) The mean scores and the 95% confidence intervals on a 0-100 scale are also shown.

HCS Item (Stage 2)	Strongly agree	Agree	Neither agree nor disagree	Disagree	Missing values	Mean score (95% CI)
I know enough about my health	163 (43%)	173 (45%)	38 (10%)	6 (2%)	1 (0.3%)	76.6 (74.2 to 79.0)
I can look after my health	154 (40%)	149 (39%)	65 (17%)	13 (3%)	0	72.2 (69.4 to 75.0)
I can get the right help if I need it	192 (50%)	153 (40%)	29 (8%)	4 (1%)	3 (0.8%)	80.3 (78.1 to 82.6)
I am involved in decisions about me	201 (53%)	121 (32%)	44 (12%)	14 (4%)	1 (0.3%)	78.0 (75.2 to 80.7)

The mean HCS summary score on the 0-12 scale is 9.2, SD 2.4, interquartile range 8 to 11, negative skew -0.9 and kurtosis 0.4. When transposed to a 0-100 scale the mean HCS score is 76.7 (95% CI 74.6 to 78.8, SD 20.4).

The ceiling state (*strongly agree* on all four items) accounted for 23% of ratings; the floor state (*disagree* on all four items) occurred once only (0.3%).

The internal structure was explored by examining the correlations between each pair of items. All inter-item correlations are in the range 0.41 to 0.59, implying that they are measuring related but different things. Cronbach's alpha = 0.82 is in the middle of the desired range.

Exploratory factor analysis results are shown in Table 3. A scree plot implies two factors, while Kaiser's criterion implies only one. This supports the view that HCS measures the same concept as the MHC confidence question, while howRu measures a separate concept. The MHC information question measures a different concept altogether.

Table 3 Factor analysis results, using oblique rotation, Promax. Only weights over 0.3 are shown.

Item	Factor 1	Factor 2	Uniqueness
HCS 1 Knowledge	0.80		0.47
HCS 2 Self-management	0.75		0.38
HCS 3 Access	0.78		0.46
HCS 4 Shared decisions	0.65		0.55
howRu 1 Discomfort		0.75	0.37
howRu 2 Distress		0.42	0.68
howRu 3 Disability		0.94	0.21
howRu 4 Dependence		0.96	0.23
MHC Confidence	0.80		0.31
MHC Information			0.97

For demographic and independent variables, the frequency distribution, mean HCS scores (0-100 scale) and confidence intervals are shown in Table 4.

Table 4: Independent variables frequency distribution, mean HCS score (0-100 scale) and confidence limits (Study 2).

Variable	n	%	Mean HCS score	95% CI
<b>Overall</b>	378	100%	76.7	74.6 to 78.8
<b>Sex</b>				
Female	219	58%	78.0	75.3 to 80.7
Male	156	41%	74.9	71.7 to 78.1
<b>Age Group</b>				
20-29	67	18%	75.0	70.1 to 79.9
30-39	101	27%	82.3	78.3 to 86.3
40-49	86	23%	81.2	76.9 to 85.5
50-59	62	16%	81.0	75.9 to 86.1
60-69	27	7%	59.6	51.9 to 67.3
70-79	25	7%	66.3	58.3 to 74.4
80-89	10	3%	37.5	24.8 to 50.2
<b>Medication</b>				
None	126	33%	82.1	78.6 to 85.7
1 or 2 items	171	45%	78.0	74.9 to 81.0
3 or more items	80	21%	64.7	60.3 to 69.2
<b>Ethnicity</b>				
White British	284	75%	76.3	74.0 to 78.7
Any other	93	25%	78.3	74.1 to 82.4
<b>Has children</b>				
No	176	47%	77.2	74.2 to 80.3
Yes	200	53%	76.3	73.4 to 79.1
<b>Age full-time education ended</b>				
16 or under	186	49%	78.7	75.7 to 81.6
17-19	163	43%	75.0	71.9 to 78.1
20 or over	29	8%	73.2	65.8 to 80.7
<b>howRu (health</b>				

Variable	n	%	Mean HCS score	95% CI
<b>status) score</b>				
0	1	0%	50.0	10.2 to 89.8
1	6	2%	43.1	26.8 to 59.3
2	6	2%	41.7	25.4 to 57.9
3	2	1%	37.5	9.3 to 65.7
4	8	2%	60.4	46.3 to 74.5
5	14	4%	57.7	47.0 to 68.3
6	19	5%	69.7	60.6 to 78.9
7	11	3%	65.9	53.9 to 77.9
8	21	6%	68.7	60.0 to 77.3
9	39	10%	74.1	67.8 to 80.5
10	61	16%	76.6	71.5 to 81.7
11	56	15%	79.5	74.1 to 84.8
12	131	35%	87.1	83.6 to 90.6
<b>MHC Confidence</b>				
0	1	0%	16.7	-23.2 to 56.5
1	0	-	-	-
2	1	0%	16.7	-23.2 to 56.5
3	2	1%	8.3	-19.8 to 36.5
4	2	1%	33.3	5.2 to 61.5
5	1	0%	91.7	51.8 to 100
6	6	2%	58.3	42.1 to 74.6
7	67	18%	52.4	47.5 to 57.3
8	111	29%	73.0	69.2 to 76.8
9	119	31%	86.6	82.9 to 90.2
10	69	18%	95.6	90.8 to 100
<b>MHC Information</b>				
0	1	0%	66.7	26.8 to 100
1	1	0%	100.0	60.2 to 100
2	1	0%	16.7	0 to 56.5
3	0	-	-	-
4	4	1%	64.6	44.7 to 84.5
5	7	2%	67.9	52.8 to 82.9
6	3	1%	66.7	43.7 to 89.7
7	85	22%	73.5	69.2 to 77.8
8	110	29%	78.3	74.5 to 82.1
9	89	24%	78.1	73.9 to 82.3
10	78	21%	78.8	74.3 to 83.3

The HCS scores for men are lower (74.9) than for women (78.0), but not significantly ( $t(371) = 1.4, p = 0.20$ ). HCS is flat between the ages of 30 and 60 but then falls with age (Spearman's correlation,  $r = -0.22, p < 0.0001$ ).

People taking three or more medicines also have lower HCS (Spearman's correlation,  $r = -0.29, p < 0.0001$ ), a result that is confounded with age.

There are no significant differences in HCS scores according to ethnicity ( $t(370) = 0.8, p = 0.4$ ), having children ( $t(369) = 0.5, p = 0.7$ ) or education level (Spearman's correlation,  $r = 0.10, p = 0.059$ ).

HCS is moderately correlated with health status (howRu), but less at higher levels of health confidence (HCS = 10, 11 or 12) (Spearman's correlation,  $r = 0.49, p < 0.0001$ ),

Correlation between the HCS score and the MHC (My Health Confidence) Confidence item is high (Spearman's correlation,  $r = 0.76$ ,  $p < 0.0001$ ).

The MHC rating has a mean of 8.4 on the 0-10 scale. The MHC scale has a narrower dispersion than HCS (Brown-Forsythe test,  $F(1, 751) = 141$ ,  $p < 0.00001$ ).<sup>[45]</sup> The MHC standard deviation is 1.3, range 0 to 10, interquartile range 8 to 9, negative skew -1.6 and kurtosis 6.9.

The correlation between HCS score and the MHC Information item is not significant (Spearman's correlation,  $r = 0.08$ ,  $p = 0.10$ ).

## DISCUSSION

### Strengths and limitations

This is the first full account of the Health Confidence Score (HCS), which is a short generic PROM for measuring people's perceived confidence to manage aspects of their own health and care. It is readily usable on smartphones and tablets. It is designed for use across all health and social care sectors, with other modules of the R-Outcomes family.

HCS is shorter, with a lower reading age than comparable measures.

The B-COM model <sup>[46]</sup> suggests that behaviour change depends on people's capability, opportunity and motivation to change what they do. The first HCS item (I know enough about my health) relates to capability. People need to understand how their behaviour impacts their health. The second item (I can look after my health) relates to capability and motivation – they may not be able or wish to do things. The third and fourth dimensions (I can get the right help if I need it, and I am involved in decisions that affect me) relate to opportunity and how local health and care services support them.

Inter-item correlations and Cronbach's alpha are within the desired range. This suggests that, while each item measures a different aspect and is useful independently, the summary score is a meaningful summary measure.

For populations, the 0-100 scale is easy to understand and facilitates comparison of item and summary mean scores. The HCS summary score has a broad distribution of responses on a 13-point scale, with low kurtosis, which compares favorably with that of the MHC confidence rating.

HCS is strongly correlated with the MHC confidence score but not with the MHC information score (individuals' perception of the value of the information provided to them). We found no significant relationships between HCS and gender, ethnicity, education or region. All of the hypothesized associations are as expected, supporting the case for construct validity.

This study was undertaken among a convenience sample of the public who may not be a representative sample of the general population. Using a single interviewer to collect the data may have created some bias, but this is unknown.

### Comparison with existing literature

Health confidence is a broad concept, encompassing aspects of self-efficacy,<sup>[47]</sup> patient activation,<sup>[17]</sup> health literacy,<sup>[48]</sup> self-management,<sup>[49]</sup> shared decision-making,<sup>[50]</sup> capability<sup>[51]</sup> and empowerment.<sup>[52]</sup> The focus of HCS is on how people feel (perception), not on what they do (activity). This concept relates to a person when they take the survey, not to a single visit or decision, unlike measures such as CollaboRATE,<sup>[53]</sup> nor does it measure how clinicians and providers engage with people.

The scope of HCS is broader than the Patient Activation Measure (PAM), which has been reported to have issues of perceived complexity, length and understandability.[54] HCS is shorter than PAM (50 vs 299 words) with lower reading age (8 vs 13 years). HCS provides a summary score plus a score for each item, while the PAM groups patients into four levels and provides a single overall score in the range 0-100.

HCS is not a conventional outcome measure, which should always be maximized. Health confidence is sensitive to each person's existing health problems, as is activation.[55] For example, an individual without any health problems is likely to score higher than one with multiple conditions. Case mix, health status and social context must always be taken into account.

The concepts of health confidence, activation and health literacy can help us understand whether interventions reach and help their target participants, or whether only those who are already health literate are being reached.[56] Activation is essentially a mindset, while health literacy is a skill set.[57] Both are moderately correlated with physical and mental health but not with each other.[58] Health confidence includes aspects of both a mind set and a skill set.

### **Implications for practice**

At the individual level, HCS results may help clinicians to tailor decisions to patient's needs, be shared with patients and carers and incorporated into EHRs.[59,60] The availability of Read codes and SNOMED CT codes makes HCS straightforward to integrate with EHR systems.[44]

At the aggregate level, HCS item and summary scores can be integrated into interactive real-time dashboards to provide rapid feedback for clinicians, managers and commissioners. The What Matters Index, which uses MHC with four other questions, has advantages over 6(CRM) at predicting and controlling hospital costs.[61] It is probable that HCS could be used in a similar way.

The HCS meets the need for a short easy to use measure of health confidence. It can be collected on smartphones and other devices that people already use. The HCS is usually used as part of a longer questionnaire, with other R-Outcomes' measures, such as *howRu*, *howRwe* and the PWS, which supports or evaluates patient-centred care.[62] Surveys are administered digitally or on a single sheet of A4 paper and include a text box to allow respondents to expand on their answers.

### **CONCLUSIONS**

The Health Confidence Score (HCS) is a generic measure of an individual's confidence in their capability, opportunity and motivation to participate in and look after his or her own health. It is shorter and has a lower reading age than other widely used instruments. It has good psychometric properties and construct validity.

### **Contributorship**

TB designed the questionnaire with CB and wrote the first draft of the paper. HWWP designed the surveys with TB. TB, HWWP and PB performed the analyses. All authors contributed to the final text, read and approved the final manuscript.

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### **Competing interests**

TB is a director and shareholder in R-Outcomes Ltd, which owns the copyright of the Health Confidence Score and provides quality improvement and evaluation services using it.

HP has done consultancy work for Crystallise Ltd, unrelated to the work reported herein. The authors declare that they have no other conflicting interests.

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### **Authors' information**

The Health Confidence Score is copyright of R-Outcomes Ltd. Those wishing to use the Health Confidence Score should contact R-Outcomes Ltd (web site: <http://r-outcomes.com>, or email [info@r-outcomes.com](mailto:info@r-outcomes.com)).

### **List of abbreviations**

B-COM	Behaviour, Capability, Opportunity and Motivation
CI	Confidence Interval
CRM	Computer-generated Risk Model
FKG	Flesch Kincaid Readability Grade
HCS	Health Confidence Score
HLQ	Health Literacy Questionnaire
KPI	Key Performance Indicator
MHC	My Health Confidence
NHS	National Health Service
PAM	Patient Activation Measure
PHE-s	Patient Health Engagement Scale
PWS	Personal Wellbeing Score
SD	Standard Deviation

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