Self-efficacy: A tool for people with diabetes managed by continuous subcutaneous insulin infusion

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Citation: Morrison G, Weston P (2013) Self-efficacy: A tool for people with type 1 diabetes managed by continuous subcutaneous insulin infusion. *Journal of Diabetes Nursing* **17**: 32–7

Article points

1. Self-efficacy is a person's belief in his or her capabilities, which influences outcomes; the intensity of an individual's self-efficacy will play a major role in how any goals, tasks and challenges are approached.
2. A tool was developed to measure self-efficacy in individuals with diabetes managed by continuous subcutaneous insulin infusion; scores can be analysed and used to tailor management.
3. The test cohort reported that the self-efficacy scale was quick and easy to understand; the authors found their tool to be effective at identifying individuals' strengths and limitations.

Key words

- Continuous subcutaneous insulin infusion
- Self-care scale
- Self-efficacy

Authors

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A key determining factor that affects individuals' ability to achieve a specific educational objective is their personal level of self-efficacy (Bandura, 1997). Self-efficacy is individuals' belief in their capabilities, which influences outcomes, and evolves as individuals acquire new skills, experiences and understanding. Thus a high level of self-efficacy in people with diabetes can result in improved self-care behaviour, glycaemic control, general health, mental health and social functioning. This article reviews the concept of self-efficacy and describes the design and implementation of a tool in clinical practice that measures self-efficacy in individuals with diabetes managed by continuous subcutaneous insulin infusion. Any deficits in specific areas identified can be targeted by a personal educational or behavioural intervention.

People with diabetes who use continuous subcutaneous insulin infusion (CSII) must take responsibility for the day-to-day control and management of their condition. Although education is considered to be the "cornerstone" of diabetes care (Department of Health [DH], 2001), for it to be effective in promoting self-care it must provide the individual with knowledge and skills that encourage understanding and confidence regarding diabetes management (NICE, 2003; 2008).

The concept of self-efficacy

Self-efficacy can be defined as:

> *"... people's beliefs about their capabilities to produce designated levels of performance that exercises influence over events that affect their lives" (Bandura, 1994).*

Bandura (1992) suggests that self-efficacy beliefs begin in early childhood as children deal with a wide variety of experiences, tasks and situations. However, even as an adult self-efficacy continues to evolve, as individuals acquire new skills, experiences and understanding.

Behaviours and beliefs regarding self-efficacy are task-specific; the intensity of self-efficacy conviction will affect the action individuals take, the amount of time and effort they are prepared to invest in a task, their resilience to difficulties and, ultimately, what they can accomplish (Maibach and Murphy, 1995). Thus self-efficacy is a dynamic, changeable belief that can be enhanced by behavioural interventions, achieving improved motivation for behavioural effort (Maibach and Murphy, 1995).

In diabetes, behavioural interventions have been successful in developing specific (Schlundt et al, 1999) or more general (McCaul et al, 1987; Hurley and Shea, 1992; Senecal et al, 2000) self-efficacy beliefs, resulting in improved glycaemic control (Kavanagh et al, 1993; Grey et al, 1998), self-care behaviour (Rubin et al, 1993) and perceived improvement in general health, mental health and social

functioning (Aalto and Uutela, 1997); all of these attributes are desirable outcomes for individuals with diabetes.

Virtually everyone can identify goals that they would like to accomplish; however, the intensity of an individual's self-efficacy will play a major role in how any goals, tasks and challenges are approached (Bandura, 1994). As Bandura (1994) suggests, individuals with a high level of self-efficacy will:

- See a challenging problem as a task to be mastered.
- Have an augmented interest in the activity that they are attempting to achieve.
- Be more committed to achieving a defined goal.
- Recover quickly from a setback.

However, individuals with a weak sense of self-efficacy will:

- Avoid a challenging task.
- Believe that a difficult task is beyond their capabilities.
- Focus on personal failings and negative outcomes.
- Quickly lose confidence in their personal abilities.

According to Staples et al (1998) there are four key sources of information that individuals use to formulate their self-efficacy judgments:

- Mastery experience – previous successful accomplishments will raise mastery expectations, while repeated failure will lower them.
- Vicarious experience – self-efficacy can be gained by watching others perform an activity successfully.
- Social persuasion – a common example of social persuasion is to include an activity such as coaching, and give evaluative feedback.
- Psychological response – an individual's own physiological or emotional state can influence self-efficacy judgments regarding a specific task. For example, a person's pessimistic emotional reaction such as anxiety or low mood can lead to negative judgments regarding his or her ability to complete a task.

Critics such as Hawkins (1995) argue that self-efficacy is a cause of behaviour, not a predictor as suggested by Bandura (1977). Indeed, Hawkins (1995) suggests that it is the degree of interest shown by an individual in a subject (interest theory) that is actually the predictor of success. Alternatively, attribution theory suggests that the success or failure of a specific task depends on the amount of effort an individual exerts on it (Mayer, 2003).

The role of self-efficacy tools in clinical practice

An individual's level of self-efficacy is affected by behavioural choices, motivation, thought patterns and the concept of destiny (Bandura, 1994). As self-efficacy impinges on health behaviours and providing it can be measured, this information can be analysed and used as a catalyst to help the individual achieve a positive outcome regarding a specific task. Alternatively, data can be "pooled" so that the level or intensity of self-efficacy in a designated group regarding a particular activity can be measured; depending on the factor under scrutiny, the information can be used to help "benchmark" issues such as patient satisfaction and education.

Although a self-efficacy tool follows a set structure, a generic form of the questionnaire does not exist, as it would have no relevance to a condition-specific area, such as insulin pump therapy (Bandura, 2006). In view of this, the CSII team at the Royal Liverpool University Hospital developed a specific tool that would measure self-efficacy in individuals using CSII.

Development of a self-efficacy tool for CSII

Preliminary work

Constructing a self-efficacy scale requires groundwork to identify all of the factors and challenges that an individual requires to perform an identified goal (Bandura, 2006). A 25-item patient questionnaire was devised to assess key self-care tasks for the effective management of diabetes with CSII, as defined by the CSII team at the Royal Liverpool University Hospital. Care was taken to build in graduations of difficulties into the efficacy items in order to avoid the "ceiling effect". This occurs when a test is too easy and many of the participants score near the top; therefore, the test is unable

Page points

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3. A 25-item patient questionnaire was devised to assess key self-care tasks for the effective management of diabetes with continuous subcutaneous insulin infusion (CSII), as defined by the CSII team at the Royal Liverpool University Hospital.

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to distinguish between individuals and does not give much information about their competencies. As suggested by Polit and Hungler (1997), the questionnaire was piloted to assess its feasibility and consider if improvements to the project could be made.

Content validity

Measures of self-efficacy for health behaviours may be defined in either a broad (i.e. healthy food consumption) or narrow (i.e. consumption of high-fibre food) way (Schwarzer et al, 2008). Key themes in the questionnaire were identified by the CSII team and a focus group of six experienced insulin pump users. The finalised statements were those felt to best represent self-efficacy in relation to important self-management skills regarding CSII and professional relationships with the insulin pump team. As with any self-reported method of reporting there is always the risk of bias; for example, some individuals may misrepresent their true views or traits in the questionnaire by giving answers that they feel represent an expected opinion (Polit and Hungler, 1997).

Given the complexity of human functioning it must be acknowledged that there are many factors that are predictors of success in insulin pump therapy, and not just self-efficacy (Pajares, 2002). However, self-efficacy does have a major impact on everything, from a person's psychological state to the motivation to succeed at a task.

Box 1. Example of the analogue scoring used in the Royal Liverpool University Hospital's confidence in diabetes self-care scale for insulin pump users.

Below is a list of activities that you have to perform to effectively manage your diabetes. Please read each statement and circle the number that you feel best describes how confident you are about carrying out the activity, from 0=not confident, through 5=moderately confident, to 10=completely confident.
Score each question using the phrase *"I believe I can…"*

Q1. Operate my pump safely

0	1	2	3	4	5	6	7	8	9	10

Q2. Effectively count the carbohydrate content of food

0	1	2	3	4	5	6	7	8	9	10

Note: The questionnaire consists of 25 questions — all questions and their scoring from the test cohort are given in *Table 2*.

Questionnaire construction

The construction of a self-efficacy scale relies on sound analysis of the relevant spheres of functioning (Bandura, 2006). Thus the design of the 25 statements requires knowledge of the activity or activities required to complete a given goal. As a consequence, comprehensive self-efficacy scales should not only have predictive utility but also provide insights into the dynamics of self-management of behaviour (Bandura, 2006).

As self-efficacy is concerned with an individual's perceived capability, Bandura (2006) states that items should be phrased in items of "can do" rather than "will do"; "can" is a judgment of capability, while "will" is a statement of intent. This is also supported by Schwarzer et al (2008), who highlight the importance of theory-based item wording, which is easy for the patient to follow. Consequently, in keeping with the evidence each item on the questionnaire is preceded by the statement "I believe I can...".

Using Bandura's (2006) methodology for measuring self-efficacy beliefs involves presenting individuals with an action or activity that requires a different level of task demand. Individuals rate their belief regarding their ability to carry out a specified activity on an analogue scale, from 0 (cannot do) to 10 (certainly can do); the results can then be easily measured and analysed (Wang and Wang, 2006) (*Box 1*).

Piloting the self-efficacy tool for CSII

Test cohort

Adults with diabetes managed with CSII who sequentially attended the diabetes clinic at the Royal Liverpool University Hospital in 2009 were asked to complete the authors' self-efficacy tool for insulin pump users. The cohort comprised 100 individuals who had been converted from multi-dose insulin injections to CSII because of glycaemic instability: 97 had type 1 diabetes; two had type 2 diabetes; and

one had type 3 diabetes (diabetes developed from other pathology) as a result of pancreatic surgery. General characteristics of the cohort are shown in *Table 1*.

Table 1. General characteristics of 100 people with diabetes recruited to trial the Royal Liverpool University Hospital's self-efficacy tool for insulin pump users.

Characteristic	Mean (± SD)	Range
Age (years)	45.5 (± 14)	16–72
Diabetes duration (years)	25.8 (± 15.4)	2–68
Duration of CSII (months)	39.1 (± 21.7)	2–88

CSII=continuous subcutaneous insulin infusion; SD=standard deviation.

Findings and evaluation

The area with the lowest mean self-efficacy score of 7.0 was in relation to keeping blood glucose values in the normal range when stressed; the highest mean self-efficacy score of the group, 9.5, related to keeping clinic appointments.

The participants managed with CSII reported that the self-efficacy scale was quick and easy to understand. They found the process intriguing, with personal scores becoming discussion points during their consultation. The process appeared to increase motivation and promoted self-directed goal setting, which in itself is a strategy that promotes self-efficacy.

In keeping with the findings of Pajares (2002), the level of self-efficacy affected how the pump user responded to failure. Individuals with a high self-efficacy score took a wider overview of a defined task and put in a high level of effort to complete the challenge than those with low scores. As self-efficacy also affects how a person responds to failure, individuals with a high level of self-efficacy attributed their failure to external factors, while those with low self-efficacy attributed their failure to low ability. Individuals with a low self-efficacy score often believed that tasks were harder than they actually were; this tended to result in poor task planning as well as increased stress.

The results of this pilot study demonstrated that participants generally scored a high mean self-efficacy score for the items identified in the Royal Liverpool University Hospital's confidence in diabetes self-care scale for insulin pump users. In addition, the mean scores for those items designed to measure professional relationships indicated a high level of satisfaction.

A potential concern regarding the implementation of the self-efficacy questionnaire was that it could monopolise consultation time; the authors found that this was easily overcome by encouraging individuals to complete the questionnaire before their consultation.

Implications for clinical practice

In clinical practice the authors have found the self-efficacy questionnaire to be a useful tool, which has helped the CSII team to work in partnership with individuals with diabetes, as recommended by the DH (2001). Scores are reviewed and discussed with individuals once they have filled in the questionnaire at their appointment. This approach encourages individuals to set a goal for an area of insulin pump therapy they feel able to tackle; at the next appointment, individuals' progress can be measured using the analogue scale to determine the perceived progress they have made. It also provides an opportunity for the individual to discuss any problem areas on a one-to-one basis, so that issues concerning the low score can be clarified. The questionnaire is quite flexible and is easily adaptable for use in other subgroups, not just those using CSII.

Thus the authors have found that the questionnaire effectively promotes discussion between the individual and healthcare professional, encouraging them to work together to agree a management plan that includes identifying and agreeing educational goals. If education is tailored to promote success then personal self-efficacy will be enhanced (Margolis and McCabe, 2004).

Strategies that the authors use include:

- Linking new issues to resent successes.
- Reinforcing effort and persistence.
- Identification of personal goals by the individual with diabetes.
- Encouragement of facilitative attributions.
- Personalising education for struggling learners.

- Working within a framework, which is likely to improve self-efficacy.

As stated above, the authors have found it useful to compare self-efficacy scores from the previous appointment with the individual's most recent score as an indicator of progress; indeed, highlighting success in an area where a person expects to fail can be a tactic that actually enhances the individual's level of self-efficacy.

Table 2. The Royal Liverpool University Hospital's confidence in diabetes self-care scale for insulin pump users: Collective self-efficacy scores of the trial cohort (*n*=100).

Question: "I believe I can..."	Mean (± SD)	Range
Q1. Operate my pump safely	9.2 (± 1.03)	6–10
Q2. Effectively count the carbohydrate content of food	7.9 (± 1.55)	5–10
Q3. Administer bolus insulin in line with the type of food and its carbohydrate value	8.1 (± 1.34)	5–10
Q4. Check my blood glucose levels at least four times a day	9.4 (± 1.47)	3–10
Q5. Effectively manage my diabetes when I am more physically active, such as exercising	7.9 (± 1.76)	3–10
Q6. Effectively manage my diabetes when I am ill	8.0 (± 1.86)	3–10
Q7. Detect high blood glucose levels in time to correct	7.9 (± 1.91)	4–10
Q8. Detect low blood glucose levels in time to correct	8.1 (± 1.85)	3–10
Q9. Appropriately correct a high blood glucose level	8.6 (± 1.35)	5–10
Q10. Treat a "hypo" correctly	9.0 (± 1.38)	5–10
Q11. Keep daily records of my blood glucose test results	8.8 (± 2.12)	1–10
Q12. Decide when it is necessary to contact my doctor	9.1 (± 1.06)	7–10
Q13. Decide when it is necessary to contact my specialist nurse	9.1 (± 1.31)	6–10
Q14. Ask my doctor questions about my treatment plan	9.0 (± 1.28)	6–10
Q15. Ask my specialist nurse questions about my treatment plan	9.4 (± 0.81)	7–10
Q16. Keep my blood glucose values in the normal range when under stress	7.0 (± 2.16)	1–10
Q17. Ask my family or relatives to help with my diabetes	7.7 (± 2.8)	1–10
Q18. Inform colleagues / others of my diabetes if needed	8.3 (± 2.15)	1–10
Q19. Keep my medical appointments	9.5 (± 0.87)	7–10
Q20. Exercise two or three times per week	7.52 (± 3.26)	1–10
Q21. Effectively manage blood glucose values when eating out	7.5 (± 2.11)	2–10
Q22. Effectively manage my blood glucose levels when drinking alcohol	8.0 (± 1.76)	5–10
Q23. Manage my diabetes when travelling	8.34 (± 1.71)	2–10
Q24. Check my feet for sores and blisters each day	8.65 (± 1.47)	5–10
Q25. Read and hear about diabetes complications without getting discouraged	7.82 (± 2.55)	1–10

SD=standard deviation.

The collective scores of a cohort, such as those presented in *Table 2*, can be used for audit purposes. As some of the questions relate to service provision, these results can be used collectively to highlight any specific trends that identify the need for service improvement or review. Trend analysis of the level of self-efficacy regarding a specific task within a group of people can benchmark the success of a specific educational intervention. This information can be used to refine and develop education programmes.

Perhaps a further area for study could be the analysis of an individual's HbA_{1c} value when looked at alongside the questionnaire scores. However, HbA_{1c} is too crude a measurement to use in isolation, as a target HbA_{1c} result does not always equate to glycaemic stability or reflect the individual's level of self-efficacy in all of the domains tested.

Reliability and validity

There are many forms of reliability, all of which will have an effect on the overall consistency with which the instrument measures the data collected. For this pilot study the authors looked at using an inter-rater approach; however, with hindsight a re-testing technique may have been more appropriate (Polit and Hungler, 1997).

The content validity of a tool is often based on judgment, as there are no totally objective ways of ensuring adequate coverage of an instrument (Polit and Hungler, 1997). An obvious issue for any questionnaire is that it can lack validity for a number of reasons, including the fact that participants may give the answers that they think are desired.

For the Royal Liverpool University Hospital's confidence in diabetes self-care scale for insulin pump users, content validity was confirmed by the focus group members once the questionnaire had been constructed. In addition, the tool was considered in terms of the "known group technique"; this included looking at the scores of individuals with opposing variables, such as those who were quite new to pump therapy and those who were experienced pump users, or those with poor self-care compared with those with a high level of personal management.

Conclusion

When assisting individuals to enhance their self-care, assessing the intensity of their self-efficacy regarding a specific activity or behaviour is helpful; once a deficit is identified, it can be targeted by a personalised educational or behavioural intervention, depending on the item tested.

In all of the areas surveyed, the participants indicated positive relationships with the CSII team and confidence regarding the management of specific self-care areas. The authors found their customised self-efficacy questionnaire to be an effective, flexible tool that could identify patterns of strengths and limitations in perceived capability within the selected cohort of people using CSII, as well as being a useful tool in assisting them with their service review. ■

If you would like a copy of the self-efficacy scale, please email gillian.morrison@rluht.nhs.uk.

Aalto A, Uutela A (1997) Glycaemic control, self-care behaviours and psychosocial factors among insulin-treated diabetics: A test of an extended health belief model. *Int J Behav Med* **4**: 191–214

Bandura A (1977) Self-efficacy: Towards a unifying theory of behavioural change. *Psychol Rev* **84**: 191–215

Bandura A (1992) Exercise of personal agency through the self-efficacy mechanisms. In: Schwarzer R, ed. *Self-efficacy: Thought Control of Action.* Hemisphere, Washington DC, USA

Bandura A (1994) Self-efficacy. In: Ramachaudran VS, ed. *Encyclopaedia of Human Behaviour.* Volume 4. Academic Press, New York, NY, USA: 71–81

Bandura A (1997) *Self-Efficacy: The Exercise of Control.* WH Freeman, New York, NY, USA

Bandura A (2006) Guide for constructing self-efficacy scales. In: Pajares F, Urdan T, eds. *Self-efficacy Beliefs of Adolescents*. Information Age Publishing, Greenwich, CT, USA: 307–37

Department of Health (2001) *National Service Framework for Diabetes: Standards*. DH, London

Grey M, Boland EA, Davidson M et al (1998) Short-term effects of coping skills training as adjunct to intensive therapy in adolescents. *Diabetes Care* **21**: 902–8

Hawkins RM (1995) Self-efficacy: a cause of debate. *J Behav Ther Experiment Psychiatry* **26**: 235–40

Hurley CA, Shea CA (1992) Self-efficacy: Strategy for enhancing diabetes self-care. *Diabetes Educ* **18**: 146–50

Kavanagh DJ, Gooley S, Wilson PH (1993) Prediction of adherence and control in diabetes. *J Behav Med* **16**: 191–214

McCaul KD, Glasgow RE, Schafer LC (1987) Diabetes regimen behaviours: Predicting adherence. *Medical Care* **25**: 868–81

Maibach E, Murphy DA (1995) Self-efficacy in health promoting research and practice: Conceptualisation and measurement. *Health Educ Res* **10**: 37–50

Margolis H, McCabe P (2004) Self-efficacy: A key to improving the motivation of struggling learners. *The Clearing House* **77**: 241–9

Mayer RE (2003) *Learning and Instruction.* Merrill Prentice Hall, Upper Saddle River, NJ, USA

NICE (2003) *Guidance on the Use of Patient Education Models for Diabetes*. Technology Appraisal 60. NICE, London. Available at: http://www.nice.org.uk:80/nicemedia/pdf/60Patienteducationmodelsfullguidance.pdf (accessed 07.01.13)

NICE (2008) *Continuous Subcutaneous Insulin Infusion for the Treatment of Diabetes Mellitus*. Review of Technology Appraisal Guidance 57. NICE, London. Available at: http://www.nice.org.uk/nicemedia/pdf/TA151Guidance.pdf (accessed 07.01.13)

Pajares F (2002) *Overview of Social Cognitive Theory and of Self-efficacy.* Available at: http://www.emory.edu/EDUCATION/mfp/eff.html (accessed 07.01.13)

Polit DF, Hungler BP (1997) *Essentials of Nursing Research: Methods, Appraisal and Utilization.* 4th edition. Lippincott Williams & Wilkins, PA, USA

Rubin RR, Peyrot M, Saudek CD (1993) The effect of a diabetes education program incorporating coping skills training on emotional well-being and diabetes self-efficacy. *Diabetes Educ* **19**: 210–4

Schlundt DG, Flannery ME, Davis DL et al (1999) Evaluation of a multi-component, behaviourally oriented, problem-based "summer school" program for adolescents with diabetes. *Behav Modif* **23**: 79–105

Schwarzer R, Luszczynska A, Ziegelmann JP et al (2008) Social-cognitive predictors of physical exercise adherence: Three longitudinal studies in rehabilitation. *Health Psychol* **27** (Suppl 1): S54–63

Senecal C, Nouwen A, White D (2000) Motivation and dietary self-care in adults with diabetes: Are self-efficacy and autonomous self-regulation complementary or competing constructs? *Health Psychol* **19**: 452–7

Staples D, Hulland JS, Higgins CA (1998) A self-efficacy theory explanation for the management of remote workers in virtual organizations. *J Comp-Mediated Comms* **3**. Available at: http://jcmc.indiana.edu/vol3/issue4/staples.html (accessed 07.01.13)

Wang B, Wang D (2006) *Clinical Trials – A Practical Guide to Design, Analysis and Reporting.* Remedica, London

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