

Using educational DVDs to increase knowledge about diabetes cell therapies

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Article points

1. People with type 1 diabetes require up-to-date information on the progress of research to find a cure for type 1 diabetes. For many, hope for a cure can be motivation to maintain their current self-management.
2. In order to provide information on islet- and beta-cell therapy, an educational DVD was developed focusing on current and emerging strategies.
3. The DVD was found to be both an acceptable and effective method to improve knowledge in people with type 1 diabetes, their families and diabetes educators.

Key words

- Type 1 diabetes
- Diabetes cell therapies
- Educational DVD
- Knowledge

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The ultimate goal of research into type 1 diabetes is to find a cure. There are currently a number of research strategies under investigation to meet this goal, which aim to replace the destroyed insulin-producing beta-cells of the pancreas. It is important that people with type 1 diabetes and their healthcare professionals keep informed about these advances in research, as it can provide motivation to maintain diabetes self-management behaviour. This article presents the findings of an Australian study which evaluated the effectiveness of a DVD developed as an educational tool to provide information to people with type 1 diabetes, their families and healthcare professionals on the latest advances in islet-cell therapy.

Type 1 diabetes is an autoimmune disorder that results from the destruction of the insulin-producing beta-cells of the pancreas. People with this chronic condition require life-long injections of insulin, and, because of imperfect glycaemic control, long-term complications, such as retinopathy and nephropathy, often develop (Diabetes Control and Complications Trial Research Group, 1993). Replacing the destroyed beta-cells with surrogate insulin-producing cells overcomes the need for exogenous insulin injections (Ryan et al, 2005), thus

improving the quality of life of recipients (Poggioli et al, 2006). As well, it is expected that long-term microvascular complications should no longer occur.

One of the most promising methods of replacing the beta-cells is to use the islets from donated human pancreases. Currently, the grafts keep recipients free from insulin injections for several years only, and during this time recipients need to take oral anti-rejection medications. However, islet-cell therapy does offer hope to those who depend on daily insulin injections, in particular the estimated five million people worldwide

with type 1 diabetes (Ryan et al, 2005). Strategies are being developed to avoid the need for anti-rejection medications as these can produce unwanted side-effects such as mouth ulcers, diarrhoea, oedema and acne (Ryan et al, 2005). One such strategy is by placing islet-cells or beta-cells inside microcapsules of barium alginate, which have pores that allow the movement of nutrients and insulin, but exclude the entry of immune cells (Foster et al, 2007).

A number of alternative sources of beta-cells are under investigation, including pig islets (Hering et al, 2006), embryonic stem cells (Lees and Tuch, 2006), non-embryonic stem cells in umbilical cord blood (Yoshida et al, 2005), human fetal pancreas cells (Brands et al, 2008) and insulin-producing liver cells (Tuch et al, 2003). A major problem with islet-cell transplants is the lack of donor pancreases to isolate islets from. Although still in the experimental stages, these alternative sources of beta-cells offer the potential to overcome this problem.

Overall, although the technology related to cell therapies is complex and constantly changing due to rapid research developments in the stem-cell arena, these therapies offer people with type 1 diabetes the potential for an injection-free future, although not necessarily a cure. The rapid development also means that even better therapies may be available in the next few years. This possibility is important because it offers the motivation for people with the condition to maintain the intensive regimen that is necessary for the management of type 1 diabetes until such a therapy is available.

Hope may have an important role in chronic conditions such as type 1 diabetes: it has been theorised that hope can influence an individual's ability to adapt to illness and maintain their wellbeing (Herth, 1992; 2000). However, it is difficult for potential recipients of cell-replacement therapy to be sufficiently informed to make realistic choices about the therapies. There is, therefore, a need to provide potential cell-therapy recipients and their families with timely information,

not only to support decision-making but to motivate current behaviour. It is important to ensure that this information is current given the rapid changes that are occurring in the stem-cell field.

Interestingly, it is as difficult for healthcare professionals to remain up-to-date with the changing technologies as it is for their patients, and diabetes educators need the information as much as people with diabetes do. This is important because diabetes educators are in an ideal position to inform and support people with type 1 diabetes and their families.

Multimedia technologies, such as DVDs, are valuable resources for healthcare professionals, and provide an effective means of communicating information (Noell and Glasgow, 1999). The advantages of DVDs include increased accessibility and acceptability, especially by younger people. Importantly, the multimedia capacity of DVDs allows for creativity with sound and pictures to impart messages, as well as the interactive components that enable the user to view at leisure, pause, rewind or stop as necessary (Orringer et al, 2005). Finally, DVDs are a cost-effective way of distributing this information widely to people with type 1 diabetes, their families and healthcare professionals. DVDs may be viewed on their own or as part of a package, which may include a discussion group or other components.

In response to the need for accessible information on cell therapies, the Diabetes Transplant Unit (DTU) based at the Prince of Wales Hospital, Sydney, Australia, professionally produced an 18-minute educational DVD which explained current and emerging cell therapies. The DTU is well placed to lead the production of the DVD because it is involved in investigating different ways to treat type 1 diabetes with beta-cell replacement therapies. These include the use of human islets, pig islets (xenotransplantation), stem cells and liver cells differentiated into insulin-producing cells. Providing current information to

Page points

1. A number of alternative sources of beta-cells are under investigation.
2. Overall, although the technology related to cell therapies is complex and constantly changing due to rapid development, these therapies offer people with type 1 diabetes the potential for an injection-free future.
3. Multimedia technologies, such as DVDs, are valuable resources for healthcare professionals, and provide an effective means of communicating information.

Page points

1. The purpose of the current study was to evaluate the effectiveness of a DVD entitled “Cell Therapies for Type 1 Diabetes”.
2. A pre- and post-intervention design was used in the study, with an assessment conducted immediately before and after viewing the DVD, and 4–6 weeks later.
3. A survey was developed for the study, consisting of four components: a knowledge questionnaire, the Herth Hope Index (HHI; Herth, 1992), a demographic and clinical checklist (age, gender, educational status, and diabetes duration), and a questionnaire that evaluated satisfaction with the DVD.

healthcare professionals, people with type 1 diabetes, and the general public is an important part of the DTU’s work.

Aim

The purpose of the current study was to evaluate the effectiveness of a DVD entitled “Cell Therapies for Type 1 Diabetes” on improving knowledge of cell replacement therapies and levels of hope in people with type 1 diabetes and their families, and increasing the knowledge of diabetes educators.

Method

The DVD required multidisciplinary input, including the DTU staff who presented the information, and the Educational Media Unit at the University of New South Wales that translated the material into a visually-appealing package. The DVD has four sections:

- Basic introductory information about type 1 diabetes.
- An update on current therapies (including whole pancreas transplants).
- An update on emerging therapies (including human islet transplants, xenotransplantation, differentiating stem cells, converting liver cells into insulin-producing cells, and encapsulation of transplanted cells).
- A timeline of progress to date and future prospects.

A pre- and post-intervention design was used in the study, with an assessment conducted immediately before and after viewing the DVD, and 4–6 weeks later to see if the knowledge had been retained. People with type 1 diabetes and their families, from three diabetes centres, were invited by mail, telephone or direct contact to participate in the study, and posters were displayed at the centres informing people of the study. An information statement and consent form were provided, and eligible participants were invited to attend one of several 1-hour DVD viewing sessions organised for the study. These sessions were conducted as follows:

- Welcome and introduction to the study.
- Completion of the consent form.

- Completion of the pre-viewing questionnaire.
- DVD viewing.
- Completion of the post-viewing questionnaire.
- Group discussion to answer any queries.

Participants were considered eligible for the study if they were aged 18 years or over, and fluent in English. Thirty-five people participated in the study (26 with type 1 diabetes and nine family members). This group was termed “diabetes clients” for the purpose of this study. Diabetes educators attending the 2005 Australian Diabetes Educators Association’s annual scientific meeting were also invited to participate in the study, and attended either a DVD viewing session held at the conference venue or a session following the conference. Thirty diabetes educators participated. The study was granted ethical approval from all involved institutions.

Questionnaire development

A survey was developed and validated for the study, and consisted of four components: a knowledge questionnaire, the Herth Hope Index (HHI; Herth, 1992), a demographic and clinical checklist (age, gender, educational status, and diabetes duration), and a questionnaire that evaluated satisfaction with the DVD. The satisfaction questionnaire was completed after viewing the DVD. The full questionnaire took approximately 15 minutes to complete.

The knowledge questionnaire was developed to assess participants’ knowledge of cell therapy for type 1 diabetes, and was based on the information delivered in the DVD plus an extensive literature search. The questionnaire was composed of 14 multiple-choice questions with five answer options, including an “unsure” option. Careful attention was paid to designing well-worded questions avoiding ambiguity, unnecessary technical terminology and double-barrelled questions (deVaus, 1991). The questionnaire was piloted, and content validity was then enhanced by using an expert panel composed of three diabetes educators, two endocrinologists and one person with

type 1 diabetes, who were asked to rate the relevance of each item on a five-point Likert scale, based on the recommendations of Fisher et al (2001). Items were retained if there were at least 80% agreement by the panel. As a result, one item was deleted and four items modified, resulting in thirteen questions in total. *Table 1* shows example questions from the knowledge questionnaire. Correct answers scored two points, an unsure answer one point and an incorrect answer no points. This scoring system is based on the premise that “it is preferable for the participant to recognise that they are ‘unsure’ of the answer, than for them to

‘think’ they know the correct answer when they are in fact incorrect” (King et al, 2008). Points were then summed for a potential range from 0 to 26.

General feelings of hope were assessed by the HHI. This index has 12 items with responses indicated on a four-point Likert scale and items are totalled to achieve a maximum score of 48, which indicates the highest level of hope. The HHI is reported to be reliable, with an alpha coefficient of 0.97 and a 2-week test–retest reliability score of 0.91 (Herth, 1992). It is also reported to be sensitive to changes in levels of hope and has been used extensively in

Table 1. Example questions from the knowledge questionnaire (correct answers in bold).

DVD section	Question
What is diabetes?	1. Type 1 diabetes is the result of: (a) The body producing insulin that does not work properly. (b) Eating too much sugar. (c) The immune system destroying insulin-producing cells. (d) Damage to the spleen. (e) Unsure.
Current therapies	5. Which one of the following statements about whole pancreas transplants is true? (a) 83% of people do not require insulin injections 1 year after being transplanted. (b) The major criterion for selection of recipients is threatened loss of vision. (c) Anti-rejection drugs given to prevent the immune system destroying the transplanted pancreas do not have side-effects. (d) There is no shortage of donor organs. (e) Unsure.
Emerging therapies	6. A major problem with islet-cell transplants is: (a) The need for major surgery. (b) They are not available in Australia. (c) They do not work in humans. (d) The lack of donor pancreases to isolate islets from. (e) Unsure.
Timeline	13. [On the DVD] How close do researchers say they are to finding a cure for type 1 diabetes? (a) “Closer than we have ever been before”. (b) “There will be a cure by next year” (c) “We are no closer to finding a cure” (d) “It is unlikely there will ever be a cure for diabetes” (e) Unsure.

Page points

1. A total of 35 diabetes clients and 30 diabetes educators completed the pre- and immediately post-viewing survey, and 23 diabetes clients and 23 diabetes educators completed the final survey at 4–6 weeks.
2. A comparison of baseline knowledge scores between participants who completed the study and those who were lost to follow-up at the 4- to 6-week time point, showed no significant difference.

acutely ill, terminally ill, and chronically ill adult populations (Wall, 2000; Bluvol and Ford-Gilboe, 2004).

Feedback on the DVD was assessed using a questionnaire developed specifically for the purpose. There were eight items that related to satisfaction with the content and format of the four sections of the DVD. Participants responded using a five-point Likert scale graded from “strongly disagree” to “strongly agree”. Responses were totalled to achieve a potential range of scores from 8 (very unsatisfied) to 40 (very satisfied). An open-ended question encouraged participants to make any further comments.

Procedure

The DVD viewing sessions were facilitated by a diabetes educator, who provided the questionnaires to participants before viewing the DVD, immediately following viewing, and at 4–6 weeks. Only those in the “diabetes clients” group received the HHI.

Following viewing of the DVD and completion of the questionnaire, there was a brief group discussion to answer any questions and gain further verbal feedback regarding the content and presentation of the DVD (not analysed).

A total of 35 diabetes clients and 30 diabetes educators completed the pre- and immediately post-viewing survey, and 23 diabetes clients and 23 diabetes educators completed the final survey at 4–6 weeks. A comparison of baseline knowledge scores between participants who completed the study and those who were lost to follow-up at the 4- to 6-week time point, showed no significant difference (diabetes clients: 15.8 versus 14.1, $P=0.20$; diabetes educators: 20.4 versus 17.7, $P=0.09$).

Data analysis

Following anonymisation of the questionnaires, data were collated and analysed. Means, frequencies and percentages were used to describe the sample and satisfaction responses. The effect of the DVD was assessed by comparing pre-

and post-viewing scores on the knowledge questionnaire and the HHI using paired samples t-tests at both outcome times.

Results

Demographic data are shown in *Table 2*. Knowledge scores improved significantly in both diabetes clients ($P<0.001$) and diabetes educators ($P<0.001$) immediately after viewing the DVD (*Table 3*), so that clients’ scores improved by an average of 6.5 points and educators by 4.2 points. This improvement in knowledge scores remained significant after 4–6 weeks compared with pre-viewing scores in diabetes clients ($P<0.001$) and educators ($P<0.001$). Unsurprisingly, most knowledge gains occurred in questions related to stem-cell therapies and xenotransplantation, which

Table 2. Demographic data for “diabetes clients” and diabetes educators.

Diabetes clients	
Age	35.4 years (SD±14.5)
Sex	22/35 male
English as first language	86%
Diabetes duration	13.8 years (SD±10.7)
Education:	
Bachelor’s degree	31%
Secondary school	29%
Diploma	26%
Apprenticeship	14%
Diabetes educators	
Age	87% over 40 years
Sex	27/30 female
Experience:	
>10 years	37%
6–10 years	15%
3–5 years	32%
<3 years	14%
Education:	
Nursing diploma	43%
Bachelor’s degree	30%
Master’s degree	27%

were a primary focus of the DVD.

Diabetes clients had moderately high levels of hope on the HHI before viewing the DVD (average 40.3 of a 12–48 scale) and no significant change occurred in these scores 4–6 weeks after viewing the DVD ($P=0.32$).

Both groups positively evaluated the content and format of the four sections of the DVD. The mean total score was 32.7 for diabetes clients and 31.1 for diabetes educators out of a possible score of 40, indicating overall positive agreement that the DVD was informative and well presented. The mean score for each item is provided in *Table 4*.

Discussion

When treating people with chronic disorders it is important not only to offer assistance in managing their condition, but also to provide realistic hope for the future that a better form of treatment will be found. This provides a foundation for those with the condition to persist in the face of adversity and better cope with their condition (Herth, 2000). Educating people with type 1 diabetes is important so that they are realistically informed about progress with possible emerging therapies that may be applicable to them. The “Cell Therapies for Type 1 Diabetes” DVD provides such information and was found to be an effective way to increase knowledge.

The data collected from this study indicated that viewers of the DVD, both professionals and those with diabetes and their families, improved their knowledge of cell therapies for diabetes. Importantly, viewers were able to retain this knowledge for some time after viewing the DVD, which suggests that the material was effective as an educational tool.

Although the role of diabetes educators is diverse, their primary focus is to provide people with diabetes and their families with self-management education including the knowledge, skills and motivation to effectively manage their condition (Australian Diabetes Educators Association,

2005). The workload for many educators is related to the day-to-day management of diabetes, hence, keeping up-to-date and providing education regarding advances in research about emerging cell therapies can prove problematic. However, in the authors’ experience, for many people with type 1 diabetes, knowledge of the latest advances in research to find a cure can provide a powerful motivation to adhere to their treatment regimen. The authors suggest that diabetes educators and other healthcare professionals can use educational tools, such as the DVD, both to update their own knowledge and as an effective way of providing education to people with diabetes about this important aspect of the condition.

Strengths and limitations

Educational DVDs have been found to be widely acceptable as they are accessible, self-paced and can promote learning (Orringer et al, 2005). They provide an efficient, cost-effective way to deliver new information widely, and can be updated when there are new advances in research. The authors believe that the “Cell Therapies for Type 1 Diabetes” DVD should be used as an educational tool, either as part of an education programme or alternatively it may be viewed independently, with follow-up discussion provided as necessary. Importantly, this type of DVD may be useful for other conditions where scientific advances are occurring rapidly.

Table 3. Comparison of knowledge and hope scores pre- and post-DVD viewing in “diabetes clients” and diabetes educators.

	Baseline Mean \pm SD (Range)	Post-viewing Mean \pm SD (Range)	4–6 weeks later Mean \pm SD (Range)
Diabetes clients’ knowledge scores	15.3 \pm 3.3 (8–24)	21.8 \pm 3.1* (14–26)	19.8 \pm 3.7* (8–24)
Diabetes clients’ HHI scores	40.3 \pm 4.8 (30–48)	-	39.2 \pm 4.5 (33–48)
Diabetes educators’ knowledge scores	19.8 \pm 3.7 (11–26)	24.0 \pm 2.7* (17–26)	23.3 \pm 2.5* (18–26)

* $P<0.05$; HHI: Herth Hope Index; SD: standard deviation

Although the DVD did not prove to be effective in improving levels of hope, the authors cannot be sure whether the DVD was ineffective, as clients' hope levels were fairly high to begin with. This may be the result of a volunteer sample. Importantly, the DVD did not cause a reduction in hope, suggesting that those participating in the questionnaire did not have unreal expectations before they viewed the DVD. The HHI has not been used before in diabetes, and, as such, there is a need to investigate whether the development of a diabetes-specific measure of hope is warranted.

The current study has several limitations including the small sample size, which was further depleted by the drop-out rate at 4–6 weeks. However, a comparison between those who completed the study and those who did not, showed no significant difference in their baseline knowledge scores, indicating that this did not affect the results of the study. A further limitation is that the DVD was developed to meet the needs of the English-speaking Australian diabetes community; however, it could be translated into other languages if necessary. Although produced locally, there is the potential to develop the DVD further to provide a more global perspective about current and emerging cell therapies worldwide.

Conclusion

This study found the DVD to be an effective and acceptable educational tool for increasing knowledge about cell replacement therapies in people with type 1 diabetes, their families and diabetes educators. It is the authors' opinion that the DVD can be used to provide

in-service education for diabetes educators, who are often not aware of the therapies being developed to overcome the need for insulin injections. Educators, in turn, can teach people with type 1 diabetes and their families, thereby enhancing the pool of people taught about emerging cell therapies. There is a need for further investigation into its impact on hope for a cure. ■

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Table 4. “Diabetes clients” and diabetes educators’ satisfaction with the DVD.

	What is diabetes?		Current therapies		Emerging therapies		Timeline		Total score
	Content	Format	Content	Format	Content	Format	Content	Format	
Diabetes clients (n=35)	4.1	4.1	4.2	4.1	4.1	4.1	4.1	4.0	32.7
Diabetes educators (n=30)	3.9	3.7	4.3	4.1	4.3	4.0	4.0	4.0	31.1

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The “Cell Therapies for Type 1 Diabetes” DVD is available from:
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