The Audit of Diabetes Knowledge (ADKnowl)

USER GUIDELINES

1. Introduction

1.1 The Instrument

The ADKnowl (© Bradley 1993, latest revision 23.6.09) is recommended for use to measure essential knowledge of diabetes and its management [1], offering several advantages over previous measures of diabetes-related knowledge. The ADKnowl:

- targets knowledge deficits which can be related to measurable clinical outcomes
- makes direct use of both correct and incorrect responses
- includes incorrect statements that are known to be common and/or serious misconceptions.
- discourages guessing (thus aiding interpretation of responses) through provision of a "don't know" option

The ADKnowl now includes 33 item-sets (138 items) relating to treatment, sick days, different treatment regimens (insulin/tablets), hypoglycaemia, effects of physical activity, reducing complication risks, smoking / alcohol effects, footcare, diet / food, blood glucose & HbA_{1c}.

Development of the ADKnowl is an ongoing process due to the fact that the body of diabetes-related knowledge is constantly changing. It was updated for the DAFNE (Dose Adjustment For Normal Eating) trial in 2000-2001 and subsequently during linguistic validation of Hindi and Punjabi versions for India. It most recently underwent a major update in 2009 to reflect current diabetes management, including recent changes in treatment regimens with latest insulins, other injectables and tablets. For permission to use the ADKnowl, and to ensure that you use the most up-to-date version, please contact Professor Clare Bradley before any new use [see Section 7].

1.2 Target Population

The ADKnowl is designed and developed for use with adults (aged 18+) with Type 1 or Type 2 diabetes. It may be administered by mail or in the clinic, for a range of purposes including:

1. a routine part of clinical audit cycles
2. an assessment tool with individual patients
3. a broad cross-sectional survey instrument
4. an instrument for evaluating the success of a particular educational intervention
5. a useful tool for health professionals to check the extent of their own diabetes knowledge and/or to achieve consensus amongst clinic staff.

2. Procedures for use of the ADKnowl

2.1 Choosing which items to include

The ADKnowl is a comprehensive instrument (including 138 items) recommended for analysis item-by-item. This means that each item is designed to be analysed individually for

correct and incorrect responses and can be considered separately from other items. Thus items that are not relevant for your particular purposes can be removed without affecting the validity of the instrument. Summing of responses into sub-scales and an overall scale are only recommended with reservation [see Section 3.4].

Your choice of sections for inclusion needs to be guided partly by the treatment regimens of the patients in your study, including not just whether on insulin or tablets or both, but what kind of insulin regimen (premixed or basal bolus). Some items have been developed to be specific to the knowledge needed for successful use of a flexible, intensive insulin regimen such as the DAFNE (Dose Adjustment For Normal Eating) approach [2], based upon Berger and colleagues' Structured Teaching and Treatment Programme [3]. Those item-sets should not be included in the measurement of diabetes-specific knowledge unless your patients are using a flexible, intensive insulin approach to treat their diabetes and have had training in insulin adjustment that can be expected to have taught them the answers to these questions:

- item-set 14 (previously 10) about snacks
- item-set 18 (previously 14) about alcohol quantities & insulin adjustment

If you are using the ADKnowl to measure knowledge of a specific area of diabetes, for example, food and dietary issues, it is not necessary to include other items that would not be relevant to your particular study / evaluation. Thus, you may wish to remove footcare items, for example, in these circumstances. It should be noted, however, that there are many other items that are more general (e.g. the statements given in item-set 1) and some that may be of partial relevance to your specific area of study, for example, effects of alcohol and exercise, and it may be important to retain these items. Opt-out options are included for people who never drink alcohol.

2.2 Instructions to patients

Patients need to be given written or verbal instructions that explain:

- why the questionnaire is being given to them
- what will be done with the information they provide
- how the questionnaire can be returned
- what, if any, feedback they will receive regarding correct and incorrect knowledge

Sample patient information sheets are included, which may be adapted to suit particular circumstances [see Appendix 1].

2.3 Anonymity

Whether patients can remain anonymous will depend entirely on how you intend to use the ADKnowl. If it is to be used as a broad cross-sectional survey instrument or as a routine part of clinical audit cycles, then it may be appropriate for patients to remain anonymous. In this way, patients can be assured that no-one will be able to identify them and any knowledge deficits they may have. However, in these circumstances, it will not be possible to provide feedback for individuals and correct specific knowledge deficits.

If the ADKnowl is to be used to evaluate the success of a particular educational intervention, it may also be appropriate for patients to remain anonymous. However, the evaluation may prove more useful for research purposes and for patient care if patients' responses before and after the intervention can be matched. The easiest way to do this is to ask patients to provide their names.

If the ADKnowl is to be used with individual patients as an assessment tool with possible interventions in mind, then it would be usual to ask the patient to write their name on the

questionnaire and for them to be told that their responses will be kept on file. Keeping records of patients' responses over time allows you to track improvements in knowledge and identify areas where further education may be useful.

If patients are to be anonymous then steps need to be taken to ensure that it is not possible to identify respondents. If questionnaires are to be returned in the clinic, a confidential reply box is needed. This will allow respondents to return completed questionnaires so that they are not visible to onlookers. If mailed returns are to be used, a stamped addressed reply envelope needs to be provided.

2.4 Sampling

If the ADKnowl is to be used in a survey, as part of an audit cycle or as an evaluation instrument, a representative picture of patient knowledge will be achieved only if there is an adequate cross-section of patients responding. Every person attending the clinic during a particular time period (or particular educational sessions) might be given the opportunity to complete a questionnaire, though this procedure will be likely to sample more people with problems who return more frequently for appointments. If there are different clinics, for example where evening or Saturday clinics are held for those who are working and weekday clinics are held for other patients, the different types of clinics will need to be sampled separately. Separate analysis of the different patient groups is likely to be the most informative and useful.

For a fully representative sample it is necessary to take a random sample from the overall clinic list or to include patients attending for an annual review for which all patients are invited once a year.

3. ADKnowl Results

3.1 Individual clinical use

If the ADKnowl is being used for assessment prior to possible intervention with individual patients, it may not be necessary to enter the data onto a spreadsheet or to combine the individuals' responses with others. Each response can most usefully be examined individually [see a copy of the questionnaire with correct response marked]. An incorrect response or use of the "don't know" option indicates a knowledge deficit where specific educational intervention is needed. It remains possible that some correct responses may have been arrived at by chance, although the instructions discourage this.

For the purposes of monitoring an individual's progress over time, particularly where knowledge deficits are substantial, it may be useful to enter responses on to a spreadsheet so that trends for specific areas of knowledge can be observed easily [see Section 3.2]. Where problems are less wide-ranging, it would be useful to note specific deficits, any remedial action taken and follow-up with checks to ensure knowledge has been retained on the next clinic visit.

3.2 Data entry

If the ADKnowl is to be used in a survey, as part of an audit cycle or as an evaluation instrument, individual responses to the ADKnowl items will need to be combined and analysed in relation to other data. This can be done by:

- entering the data directly into a statistics package such as SPSS, **or**

- creating a spreadsheet, either by hand or in a computer package such as Microsoft Excel or Lotus 123. Instructions for creating a spreadsheet are included [see Appendix 2].

3.2 Data entry for cultural & technical adaptations for other language / country versions

- If the ADKnowl is used in more than one language it is important to be aware of where items (in particular relating to food and diet) have to be different from the original English in order to be locally relevant. For example, adaptations were needed to the current *cheese & biscuits* item (# 16.5) for the German and Spanish versions, since *cheese & biscuits* (typically found on a UK menu as an alternative to a dessert) is not a combination offered in Germany or Spain. The adjustments, however, produced items that were locally relevant and, importantly, were phrased so that the correct answer was False as for the original English item.
- Different countries use different blood glucose measurements (mmol/L in the UK and some parts of Germany; mg/dL in other parts of Germany and in Spain). If doing a multinational study, these differences need to be borne in mind when pooling the data (see particularly #29 & 30).
- HbA_{1c} items will need careful interpretation if various study sites use different target levels or the assay varies (see #32 & 33). This can vary even within country and needs checking. In the UK most but not all are now using DCCT aligned assays for HbA_{1c}.

3.4 Scoring items

The following are guidelines on scoring, recoding and computing for the ADKnowl.

- <u>If a question is answered twice:</u> if it is not possible to interpret which of the responses is a mistake, this needs to be treated as missing data.
- <u>Missing data:</u> score all blanks as missing data (or if using a spreadsheet, put a '1' in the no response (NR) column) [see Appendix 2].

3.5 Summing of Results and Use of Sub-scales / Scale Totals

For the most part, it is recommended that ADKnowl items be scored individually in order to identify specific knowledge deficits. The ADKnowl provides the opportunity to consider the individual's (or group's) knowledge of specific diabetes-related issues. A composite score will provide no indication of which are the problem areas that need to be dealt with.

The summing of scores is often misguided, with researchers attempting to show a relationship between a total score and a specific biomedical outcome, e.g. HbA_{1c}. Such attempts have usually failed because there is little reason to expect a total score (including knowledge of footcare etc) to relate to a specific outcome such as HbA_{1c}.

If you choose to sum scores into sub-scale totals, a guide to the items that can be included in each sub-scale is provided [see Appendix 3]. It can be useful to sum subsets to identify areas for remedial education. For example, it may be that knowledge of some areas, e.g. diet and food, is good but other areas, e.g. footcare, need attention. In such cases, resources can be allocated to those aspects of education that are the most needed.

3.6 Displaying Results

It can be helpful to turn the percentage results into a series of charts for ease of interpretation. Instructions for doing so, together with a sample chart for some items, are included [see Appendix 4].

4. Interventions: the way forward

4.1 Prioritising interventions

Whether working on an individual basis or considering the results of a large cross-sectional survey, once knowledge deficits have been identified, consideration needs to be given to potential educational interventions. If further education is to be provided, it may be necessary to prioritise. Three different approaches may be adopted.

The first is to target those areas with the greatest knowledge deficits. On an individual basis, this could mean targeting general knowledge of footcare before dietary issues. For a clinic, it is possible to identify the specific items for which there are the greatest knowledge deficits. So, for example, this, specifically, might be knowledge of the most recent advice for the trimming of toenails.

The second approach is to target those areas with the most serious short-term implications followed by issues with more long-term implications. So, for example, you might prioritise recognising symptoms of and/or acting on DKA/illness before you target the importance of having regular eye examinations.

Thirdly, you might choose to prioritise according to the availability of educational material / services in your clinic. Therefore, if an educational session has already been planned on footcare, this might take priority over the effects of physical activity because resources are already available to address this issue. Although not necessarily the best rationale for the provision of education, this may be a cost-effective strategy.

The most effective interventions are likely to be those that have been informed by the needs of the patient(s) and targeted to their individual needs. Blanket group education sessions are often the most popular with clinic staff, due to their apparent cost-effectiveness, but are not necessarily the most effective for individual learning. If specific much-needed information is buried amongst hours of irrelevant or previously known material, it is much less likely to be useful than if it is the focus of a brief individually targeted education session. You might wish to consider the merits of brief one-to-one sessions focussing on individual knowledge deficits, or providing specific educational material to suit each individual's needs.

5. Criteria for modification of the ADKnowl

As the ADKnowl is designed to be analysed item-by-item, users can remove items from the ADKnowl. **Items that are retained cannot be edited**, reworded or changed in any way without affecting validity and opportunities to compare with other datasets. **Users can add new items to the ADKnowl**. The following criteria for the addition of new items are offered to ensure that new items have the same underpinning philosophy as existing items:

1. Items that were previously true and are now false can be modified to make them correct. It may be possible for the wording to remain exactly as it was, with the correct response now being 'false'.
2. 'False' items are to be used only if they are common or serious misconceptions. 'False' items:

- can be included because some people think they are true
- can be included because they used to be true
- are not normally recommended if their only purpose is to prevent guessing (e.g. 'trick' items - closely worded but wrong versions of correct items).

3. Responses to items should be likely to be predictive of a future outcome.
4. New 'true' items may be added to cover new recommendations.
5. Highly specific details need to be avoided where possible, e.g. "20%" more insulin or "20 grams" long-acting carbohydrate. This is because:
   - items that are more specific are more likely to be true in the absence of 'trick' items
   - specific recommendations may change with time and according to individual need.
6. Existing items are preferred when they can be used rather than new items because the responses can be compared with those from other datasets. Hence, we are conservative in the changes we make to the ADKnowl.

6. Note: Conditions of use of the ADKnowl

The ADKnowl is made available to users by formal arrangement with the copyright holder, Professor Clare Bradley. Requests should be made to Professor Bradley [see Section 7]. A user agreement is necessary to avoid breach of copyright and to ensure that the latest and most appropriate version of the questionnaire is used. Please note also that the ADKnowl should only be modified by the removal of irrelevant sections or the addition of new items [see Section 5]. Items to be retained should not be modified in any way without the prior written consent of Professor Bradley.

Suggestions for improvements to items are welcomed. However, it is important that changes are not simply adopted by individuals. Improvements will be co-ordinated by the scale developers, evaluated and, if found to be valuable, introduced more generally as appropriate.

7. Contact Information

For permission to use the ADKnowl and to ensure that you have the most up-to-date version, please contact:

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References

1. Speight J and Bradley C (2001) The ADKnowl: identifying knowledge deficits in diabetes care. *Diabetic Medicine* **18**(8), 626-639.

2. DAFNE Study Group* (2002) Training in flexible, intensive insulin management to enable dietary freedom in people with type 1 diabetes: the dose adjustment for normal eating (DAFNE) randomised controlled trial. *British Medical Journal* **325**, 746-749 (full 6 page version of paper published on BMJ website http://bmj.com/cgi/content/full/325/7367/746).
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3. Muhlhauser I, Bruckner J, Berger M, Cheta D, Jörgens V, Ionescu-Tirgoviste C et al (1987) Evaluation of an intensified treatment and teaching programme as routine management of Type 1 (insulin-dependent) diabetes. *Diabetologia* **30**: 681-690.

Appendix 1

Example of Patient Information Sheet (for anonymous completion*)

"We are looking at how we can improve the diabetes education provided in this clinic. It is important for us to obtain feedback about our patients' understanding of their diabetes and its management. We would be glad if you would give some time to completing this questionnaire.

Please do not write your name on the questionnaire, as it is intended to be anonymous. If you do not wish to complete it, please return the questionnaire (see below), and write on it any comments you would like to make.

If you would like some help in filling out the questionnaire, perhaps because of eyesight problems **……[insert information on how the person can obtain assistance, e.g. 'ask the receptionist, who will get someone to help you'].**

Please seal the completed questionnaire in the envelope provided and place it in the box **…… [give location of collection box, e.g. 'at the reception desk'].**

The results will be fed back by **…… [describe the way in which feedback will be given to patients, eg 'a poster which will be put up on the notice board in the clinic'].** It will not be possible to provide feedback on individual responses. Your responses will be combined with those of other people and used to inform proposals for improving the diabetes education provided by the clinic.

Thank you for your participation. Your responses will be put to good use in helping to improve the diabetes education we provide."

[Name and position of principal investigator]

[Name(s) and position(s) of clinic consultants and / or diabetes specialist nurses sharing responsibility for and giving support to the study]

Note: If only one name is given, plural wording such as 'we are' will need to be changed to the singular where appropriate throughout the document.

*** This information sheet stresses the protection of identity. It would be appropriate to ensure anonymity if the ADKnowl was to be used in a survey or as part of an audit cycle. It may also be appropriate if the ADKnowl was to be used as an instrument for evaluating the success of an educational intervention aimed at a group of people. It would not be appropriate to ensure anonymity if the ADKnowl was to be used on a one-to-one basis (see next page).**

Example of Patient Information Sheet (for one-to-one contact)

"We are looking at how we can improve our diabetes education for individuals. It is important for us to obtain feedback about our patients' understanding of their diabetes and its management. We can then assist in areas where there is misunderstanding or where additional knowledge is needed. We would be glad if you would give some time to completing this questionnaire.

It is important that you write your name on the questionnaire so that we can keep your responses with your medical notes and provide any support needed.

If you would like some help in filling out the questionnaire, perhaps because of eyesight problems **……[insert information on how the person can obtain assistance, e.g. 'ask the receptionist, who will get someone to help you'].**

We would be grateful if you could bring the completed questionnaire to your next appointment with **……[insert name of Dr, nurse, chiropodist, dietitian etc. who will be examining the answers given and providing further targeted education]** who will go through your responses with you and provide information and explanation where necessary.

Thank you for completing this questionnaire. Your responses will help us to provide you with the diabetes education that suits your individual needs."

[Name and position of principal investigator]

[Name(s) and position(s) of clinic consultants and / or diabetes specialist nurses sharing responsibility for and giving support to the study]

Note: If only one name is given, plural wording such as 'we are' will need to be changed to the singular where appropriate throughout the document.

Appendix 2

Data entry by hand, or using a spreadsheet package such as Excel

The ADKnowl items are scored on a True/False/Don't Know basis. Probably the simplest way to handle the data is to create a spreadsheet table of responses for each item. The first column will record 'patient number' and then there will be four columns for each item (including no response [N/R]). The first 11 patients of an example spreadsheet for ADKnowl items 1.1 and 1.2 are given in Figure 1.

Figure 1: Sample spreadsheet

		ADKnowl Item 1a				***ADKnowl Item 1b***			
	Patient no.	True	False	Don't Know	N/R	True	False	Don't Know	N/R
	1				1		1		
	2	1					1		
	3		1				1		
	4	1					1		
	5			1				1	
	6	1				1			
	7		1				1		
	8	1					1		
	9	1							1
	10	1					1		
	11	1					1		
Total	**11**	**7**	**2**	**1**	**1**	**1**	**8**	**1**	**1**
%	*100*	*70%*	*20%*	*10%*		*10%*	*80%*	*10%*	

For each individual, look at their response to each item. If a 'True' response has been recorded put a '1' in the 'True' column on the spreadsheet for that item. If the person has shaded 'False', record a '1' in the 'False' column. Likewise, if the response was 'Don't Know', place a '1' in the 'Don't Know' column. Finally, if the item was left blank put a '1' in the 'NR' column to signify that for this item, the patient gave 'no response'. Carry out the same procedure for each item on the questionnaire.

When all patient responses have been recorded in the spreadsheet, group totals can be calculated. Write down the sum of all the '1's in each column. Then divide the total in each column by N* (the number of people responding to that item) and multiply by 100, to obtain a percentage. (In the example spreadsheet, N for ADKnowl item 1a is 10, as there were 11 questionnaires returned, but 1 person did not complete this item).

Note that for each item, there will be 3 percentage figures calculated, and that these should always add up to 100%. This excludes the 'no response' category. The number of patients responding (N) may, of course, be different for each item.

*To calculate the item 'N', subtract the number of people who did not respond to that item from the overall number of patients returning questionnaires.

Appendix 3

Item sub-groups

Diabetes – general & treatment (3 sections)

One section for everyone;
- Section 1 (4 items); item 1.4* can be scored either here or with 'complications', but not in both places;

One section only for people who use urine glucose monitoring
- Section 2 (3 items)

One section only for people treated with tablets, with or without insulin
- Section 3 (4 items)

Sick days (3 sections)

One section for people treated with tablets, with or without insulin
- Section 4 (3 items)

One section only for people treated with a basal bolus insulin regimen (min. 4 injections/day)
- Section 5 (3 items)

One section for anyone treated with insulin, with or without tablets
- Section 6 (4 items)

Insulin / needles / injecting (1 section)

One section for anyone treated with insulin, with or without tablets
- Section 7 (8 items)

Hypoglycaemia (3 sections), for everyone

- Section 8 (5 items)
- Section 9 (6 items)
- Section 10 (8 items)

Effects of Physical Activity (3 sections)

One section for everyone
- Section 11 (3 items)

One section only for people treated with a basal bolus insulin regimen (min. 4 injections/day)
- Section 12 (5 items)

One alternative section only for those treated with premixed insulin, with or without tablets
- Section 13 (3 items)

Diet & Food (3 sections)

One section only for people treated with a basal bolus insulin regimen (min. 4 injections/day)
- Section 14 (3 items)

Two sections for everyone
- Section 15 (8 items)
- Section 16 (9 items)

Effects of alcohol (2 sections)

One section for anyone who drinks any alcohol
- Section 17 (3 items)

One section only for people treated with a basal bolus insulin regimen (min. 4 injections/day) and who drinks any alcohol
- Section 18 (3 items)

Complications (4+ sections) for everyone

- Section 1 (just item 1.4, which can be scored either here or with Section 1, but not in both places)
- Section 19 (3 items)
- Section 20 (5 items)
- Section 21 (3 items)
- Section 22 (5 items about smoking)

Footcare (6 sections) for everyone

- Section 23 (4 items)
- Section 24 (6 items)
- Section 25 (2 items)
- Section 26 (4 items)
- Section 27 (5 items)
- Section 28 (4 items)

Blood glucose control (5 sections) for everyone

Two sections about blood glucose levels
- Section 29 (2 items)
- Section 30 (2 items)

Three sections about HbA_{1c}
- Section 31 (4 items)
- Section 32 (2 items)
- Section 33 (2 items)

Appendix 4

Suggestions for displaying data

You may wish to present the ADKnowl data in an easy-to-view format. One way of doing this is to display the percentage of correct responses to particular items in a chart. NB the 'correct' response is not necessarily the one indicated as 'True' by the respondent. For some items, 'False' responses will be correct and for some, 'True' responses will be correct. A simple way to present this is to copy the column that contains the correct answer for each item to a new spreadsheet, labelled 'Correct ADKnowl Responses' [see Figure 1].

Figure 1: Sample spreadsheet for displaying correct ADKnowl responses

		Item 1a	***Item 1b***	***Item 1c***	***Item 1d***	***Item 1e***	***Item 2a***	***Item 2b***
	Patient no.	True	False	False	True	False	True	False
	1		1	1	1		1	
	2	1	1		1	1		1
	3		1	1		1	1	
	4	1	1		1		1	
	5						1	
	6	1			1	1		
	7		1				1	
	8	1	1	1	1		1	
	9	1				1		1
	10	1	1	1	1	1		
	11	1	1	1	1	1	1	1
Total	**11**	**7**	**8**	**5**	**7**	**6**	**7**	**3**
%	*100*	*70%*	*80%*	*50%*	*63%*	*55%*	*70%*	*33%*

NB The percentage figure excludes missing data.

These data can be used to create a chart that shows the results in a format that is easy to follow. The bar chart may be the most convenient way of displaying results for groups of items on one page. You may wish to show results:

- in order of knowledge, indicating where largest and smallest knowledge deficits occur for individual items.
- for different subgroups of patients, e.g. Type 1 versus Type 2 for specific comparable items [see Figure 2].
- for items where lack of knowledge may have serious short-term consequences [see Figure 3a] or long-term biomedical or psychological consequences [see Figure 3b].
- for a particular category of responses, e.g. footcare.

Figure 2:

a) Examples of correct responses by treatment type

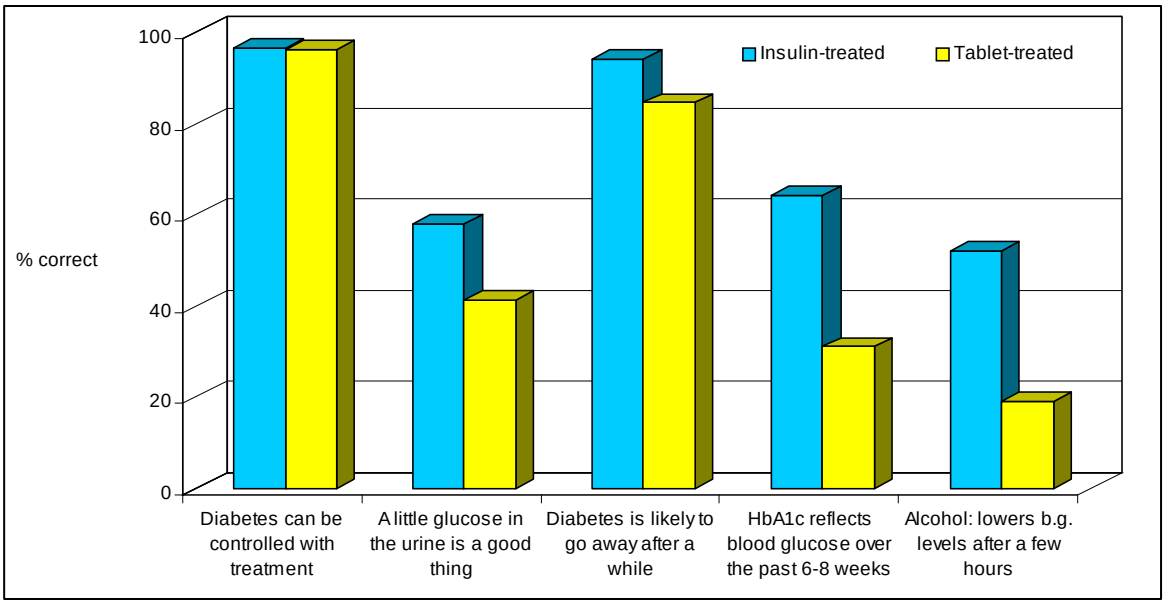
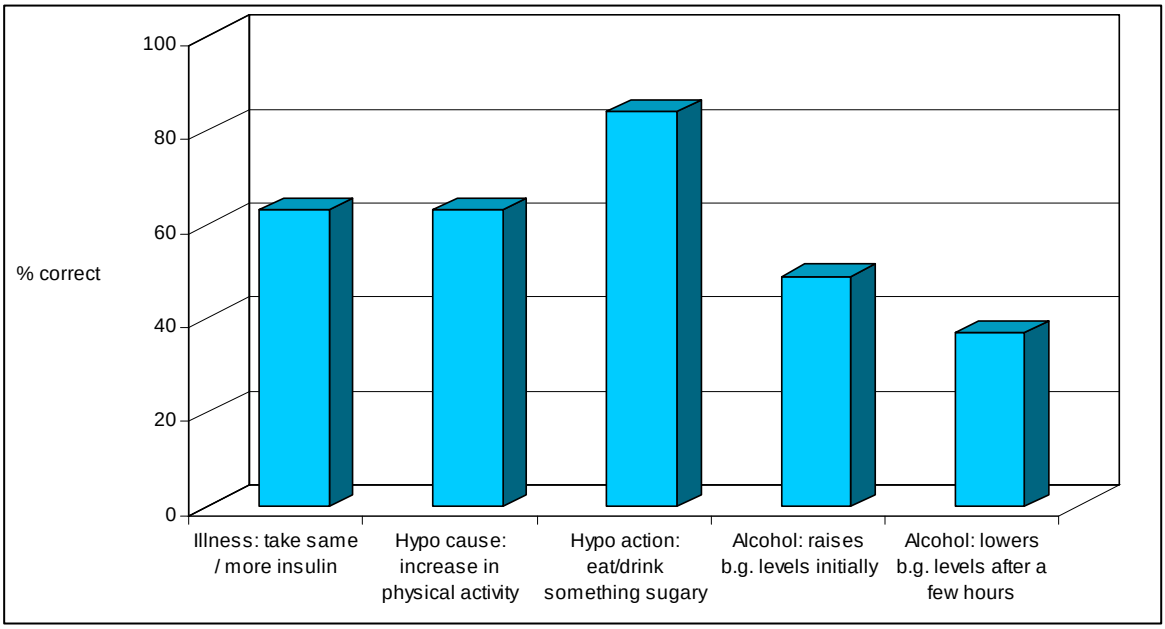


Figure 3:

a) Examples of items where knowledge deficits may have serious short-term consequences



b) Examples of items where knowledge deficits may impair long-term biomedical and/or psychological outcomes (taken from a study using an earlier wording of the 2nd item shown here, "Sugar may be…").