

## Diabetes Information Technology & WebWatch

# Retrospective Pilot Feedback Survey of 200 Users of the AIDA Version 4 Educational Diabetes Program. 1—Quantitative Survey Data

ELDON D. LEHMANN, Ph.D., F.R.C.R.,<sup>1</sup> SUKHDEV S. CHATU, M.B. B.S.(Hons),<sup>2</sup>  
and S. SABINA H. HASHMY, M.B. B.S.<sup>3</sup>

### ABSTRACT

This column reports a detailed, questionnaire-based, post-release feedback survey of 200 users of the AIDA version 4 educational diabetes simulator. AIDA is a freeware computer program that permits the interactive simulation of plasma insulin and blood glucose profiles for educational, demonstration, self-learning, and research purposes. Since its Internet launch in 1996 over 700,000 visits have been logged to the AIDA Websites—including [www.2aida.org](http://www.2aida.org)—and over 200,000 program copies have been downloaded free-of-charge. The main goals of the current study were: (1) to establish what people have thought about the AIDA program, (2) to assess the utility of the software, and (3) to ascertain how much people have actually used it. An analysis was therefore undertaken of the first 200 feedback forms that were returned by AIDA users. The questionnaire-based survey methodology was found to be robust and reliable. Feedback forms were received from participants in 21 countries. One hundred six of 209 responses (50.7%) were received from people with diabetes, and 36 of 209 (17.2%) from relatives of patients, with lesser numbers from doctors, students, diabetes educators, nurses, pharmacists, and other end users. Please note some respondents fulfilled more than one end-user category, hence the denominator >200; for example, someone with diabetes who was also a doctor. This study has established the feasibility of using a simple feedback form to survey a substantial number of diabetes software users. In addition, it has yielded interesting data in terms of who are the main users of the AIDA program, and has also provided technical (computer) information that has aided the release of a freeware upgrade to the software. In general, users reported finding the program to be of educational value. The majority also felt it would be of interest to diabetes educators and people with diabetes. Most were clear about its limitations as a simulator-based learning tool. The implications of these findings will be discussed.

---

<sup>1</sup>Department of Imaging (MRU), Imperial College of Science, Technology and Medicine (NHLI), Royal Brompton Hospital; <sup>2</sup>St. Bartholomew's and the Royal London Hospitals Medical School; and <sup>3</sup>Guy's, King's & St. Thomas' Hospital Medical School, London, United Kingdom.

The AIDA software referred to in this report is an independent, non-commercial development that is being made available free-of-charge via the Internet—at a dot org (.org) not-for-profit Website—as a non-commercial contribution to continuing diabetes education. Dr. Lehmann is a co-developer of the AIDA diabetes simulator, and Webmaster of the [www.2aida.org](http://www.2aida.org) Website.

## INTRODUCTION

**A**IDA VERSION 4 IS A FREeware computer program that permits the interactive simulation of plasma insulin and blood glucose (BG) profiles for demonstration, teaching, self-learning, and research purposes. It has been made freely available on the World Wide Web as a non-commercial contribution to continuing diabetes education. In the 10 years since its Internet launch over 700,000 visits have been logged at the AIDA Websites—including [www.2aida.org](http://www.2aida.org) and [www.2aida.net](http://www.2aida.net)—and over 200,000 copies of the program have been downloaded, gratis. Further copies have been made available, in the past, on diskette by the system developers and from the British Diabetic Association (now called “Diabetes UK”), London, UK.<sup>1</sup>

AIDA version 4 has been described in detail elsewhere in the literature,<sup>2,3</sup> and in this journal.<sup>4</sup> Briefly, it incorporates a compartmental model that describes glucose–insulin interaction in patients completely lacking endogenous insulin secretion. It contains a single extracellular glucose compartment into which glucose enters via both intestinal absorption and hepatic glucose production. The AIDA version 4 model also contains separate compartments for plasma and “active” insulin,<sup>5</sup> with the latter being responsible for glycaemic control while insulin is removed from the former by hepatic degradation. Full details of the AIDA version 4 model are accessible from within the AIDA software package,<sup>6</sup> and can be viewed and printed separately via the Internet (from: [www.2aida.org/technical](http://www.2aida.org/technical)).

It is important to note that AIDA version 4, like other model-based approaches,<sup>5,7–11</sup> is not sufficiently accurate to be used for individual patient simulation or glycaemic prediction.<sup>12–14</sup> Therefore, as the program makes clear, it is not intended for therapy planning and can only be used for teaching, self-learning, demonstration, or research purposes. While the AIDA version 4 software can simulate a wide variety of insulin dosage and dietary adjustments, it should be stressed that the purpose of AIDA is to create a learning environment for communicating and training intuitive thinking when dealing with such adjustments. In this respect AIDA appears most of use for recreating clinical sit-

uations—rather than trying to predict best outcome.

The AIDA version 4 software comes with 40 educational case scenarios as standard, each of which represents a “snapshot” of the metabolic status of a typical patient with respect to insulin-dependent (type 1) diabetes mellitus. It is easy for users to add or create further case scenarios, as required. Examples of the application of AIDA version 4 as an educational tool can be found elsewhere in the literature,<sup>4,15,16</sup> and a full demonstration can be viewed on-line at, or downloaded without charge from, the AIDA Website ([www.2aida.org](http://www.2aida.org)).

### *Evaluation approaches*

While simulation software like AIDA may intuitively appear of benefit, there is a great need for such applications to be formally evaluated. There are many different ways that this may be done. These range from the qualitative to the quantitative. In the case of AIDA a quantitative assessment was reported in 1994 to document the accuracy of the BG simulations in a group of 30 patients with diabetes.<sup>12</sup> While the simulations were shown to be unsuitable for individual patient glycaemic prediction and therapy planning,<sup>13,14</sup> they have found widespread use for educational purposes. More qualitatively, various AIDA version 4 users have written for the AIDA Website, and in print, their thoughts about the application of the software.<sup>16–18</sup> However while these user testimonials—together with more spontaneous short comments received by the AIDA system developers by electronic mail<sup>19,20</sup>—have been very encouraging, the next stage would be to undertake a prospective clinical randomised controlled trial to formally establish the educational utility of the approach. In this respect a pilot randomised controlled trial has been done with encouraging results.<sup>21,22</sup> Nevertheless, in parallel with embarking on such trials it seems sensible to actually formally establish what a wider range of users think about the software, and how they have been applying it.

It is important to stress that previous AIDA surveys/audits have been run at the point of *download*, providing information about the type of end users *who* have been downloading the

software,<sup>23-25</sup> and also aiming to establish more clearly *why* people have been turning to the Internet and downloading the program.<sup>26,27</sup>

While such surveys are of considerable interest, and have provided useful and interesting information, they cannot tell anything about actual usage of AIDA and what people think about the program. To obtain such feedback it is clearly necessary to survey users *after* they have had a chance to make use of the software for a while. This is what the current study has aimed to do by surveying 200 users of AIDA version 4.

## SUBJECTS and METHODS

### *Rationale for the survey*

To date there has been no formal assessment of people's usage of the AIDA version 4 program. However, when the software was originally released in 1996, included within the downloadable installation package, in electronic form, was a computer text file containing a feedback survey questionnaire.

Given this, the main aims of the current study have been threefold: (1) to establish what people have thought about the AIDA version 4 software, (2) to assess the utility of the program, and (3) to ascertain how much people

have actually used it. An analysis was therefore undertaken of the first 200 feedback forms that have been returned by AIDA version 4 users. There were also three ancillary objectives for this study.

The original AIDA software was extensively tested by 60 beta-testers prior to its first release. However, as operating systems have changed, and new computer hardware has become available, an ancillary purpose of the present study has been: (a) to identify any problems that users may have experienced with the software since its launch, with the intention being for any critical problems to be addressed in future upgrades. An additional purpose of the survey was also: (b) to identify features that users felt were important to have incorporated in later releases of the program. Furthermore, an important study goal was: (c) to establish the feasibility of undertaking such a post-release diabetes software survey primarily via e-mail.

In order to analyse the feedback forms received from AIDA version 4 users, and identify what a wide range of different users thought about the program, a survey could either be undertaken *prospectively*—specially inviting people to try out the software and then soliciting their feedback comments—or it could be done *retrospectively*. For the current pilot study, advantage was taken of the format of the

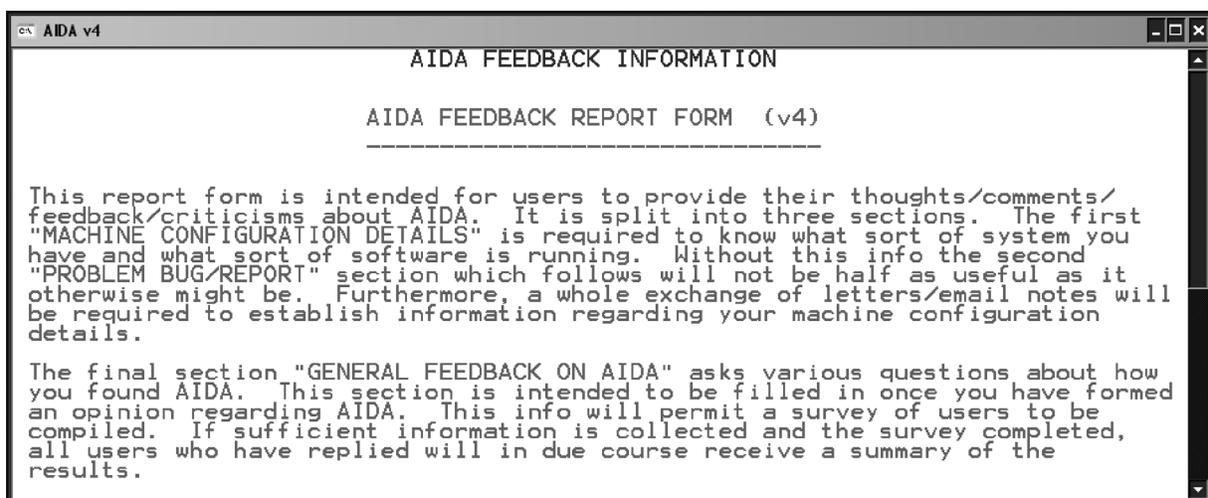


FIG. 1. Screenshot from AIDA version 4 showing how the feedback form can be viewed, and read, from within the software package. From the AIDA version 4 data entry screen, pressing the (F7) function key yields the "Options Menu" display, and pressing (c) to "View feedback form" shows this screen. The display demonstrates some of the explanations/information offered to respondents before they get to the actual questionnaire.

survey questionnaire included within the original AIDA version 4 package to undertake a *retrospective* analysis of user comments received in a semistructured way about the software. For ease of reference the full questionnaire can

be found on the Internet at: [www.2aida.org/questionnaire](http://www.2aida.org/questionnaire).

While such a survey approach will have limitations, the power of such a study comes from the relatively large number of responses that

---

MACHINE CONFIGURATION DETAILS. Please mark choice with a X/Y/N or add details.

DOS version: [ ] please specify

WINDOWS version: 3.1 [\_\_\_], 3.11 [\_\_\_], '95 [\_\_\_], NT [\_\_\_], OS/2 [\_\_\_]

Processor: 386 [\_\_\_], 486 [\_\_\_], Pentium [\_\_\_], Maths coprocessor [\_\_\_]

Monitor: [ ] please specify

Graphics adaptor: VGA [\_\_\_], SVGA [\_\_\_], other [ ] please specify

Does your machine have an S3 graphics adaptor fitted? [Y/N]

Your computer skills: novice [\_\_\_], intermediate [\_\_\_], expert [\_\_\_]

Have you been running AIDA from:

straight DOS? [Y/N]

or, from a Windows or OS/2 DOS box? [Y/N]

Is your machine part of a network? [Y/N]

If yes, has network software been operating in the background while AIDA has been running? [Y/N]

Has any other software been operating in the background while AIDA has been running? [Y/N]  
if yes, please specify [ ]

Do you have email access? [Y/N]

Do you have on-line Internet/World Wide Web access? [Y/N]

How many times have you run the AIDA program?  
0 - automatically updated and checked (!) by AIDA

How many interactive simulations have you performed?  
0 - automatically updated and checked (!) by AIDA

---

**FIG. 2.** "Machine configuration details" portion of the survey questionnaire, covering technical information about the computer hardware and operating system that the person was using, together with a self-assessment of the level of their computer skills. The data at the bottom of the figure about how many times AIDA has been run, and how many simulations have been performed, are automatically recorded by the AIDA version 4 software.

can be received. In this respect the largest two previously reported surveys of diabetes simulator feedback that can be found in the literature involved just 22 subjects<sup>28</sup> and 11 subjects.<sup>29</sup> Therefore the widespread use of AIDA version 4—and the ability to reply via e-mail—has provided considerably larger numbers of potential respondents upon which to draw ( $n = 200$ ).

### *Questionnaire*

The feedback survey questionnaire used for the current study was broadly divided into three main sections (Fig. 1). The first section of

the questionnaire—entitled “Machine configuration details” (Fig. 2)—covered technical information about the computer hardware and operating system that the person was using. In addition, respondents were asked to self-assess their level of computer skills (novice, intermediate, or expert) and provide technical information about how they had been running AIDA version 4. They were also asked if they had e-mail or Web access. The number of times that the AIDA version 4 program was run—and the number of interactive simulations performed—were automatically logged within the feedback survey file by the AIDA version 4 software.

---

PROBLEM / BUG REPORT.

Please outline any problems/difficulties/bugs that you have encountered.  
Please use as much space as required....

If AIDA generated a runtime error/gave an unexpected response/crashed details of the case scenario being simulated are vital to recreating the problem. Please specify the case number and if alterations were made to the standard cases which have been shipped with AIDA, please provide details of the entire case scenario regimen. Apologies but details of all the data entry screen fields are required if any attempt is to be made to re-simulate the problem. Also it would help a great deal if the runtime error number and/or memory address could be provided.

---

**FIG. 3.** “Problem/bug report” free-text section of the survey questionnaire—used to identify any difficulties that users may have experienced with the software.

The second section of the survey—entitled “Problem/bug report” (Fig. 3)—was used to identify in free text any difficulties that users may have experienced with the software. In particular, respondents were specifically asked if the

software gave a runtime error (or “crashed”), and they were asked to outline any problems that they experienced using the program.

The third section of the questionnaire—entitled “General feedback on AIDA” (Fig. 4)—

---

GENERAL FEEDBACK ON AIDA. Please mark choice with a X/Y/N or add details.

It would be very much appreciated if you could answer the following questions regarding your use of AIDA. Most of the questions simply require yes/no answers - but if you wish to add more information please feel free to write/type in extra feedback between the questions.

1. Have you found AIDA of interest as an educational/demonstration tool? [Y/N]
  2. Do you think AIDA has some utility? [Y/N]  
- if so can you outline briefly how you might see AIDA being used:
  3. Are you interested in continuing to use AIDA? [Y/N]
  4. Do you think local/national diabetes associations might be interested in finding out more about AIDA? [Y/N]
  5. Do you think your doctor/nurse educator would be interested in AIDA? [Y/N]
  6. Do you think AIDA is worthy of wider distribution? [Y/N]
  7. If you are a diabetic patient, would you tell fellow diabetic patients about AIDA? [Y/N]
  8. Do you think AIDA is in any way dangerous? [Y/N]
  9. Do you think the caveats provided with AIDA make clear its limitations? [Y/N]
  10. If you are a diabetic patient, have you tried typing in your own data into AIDA? [Y/N]  
- if yes, did the simulations in any way match what actually happened to your blood glucose values? [Y/N]  
- Was it clear to you that AIDA was not intended for this purpose? [Y/N]
  11. What other features would you like to see in later releases of AIDA?  
Wish list, use as much space as required!
- 

**FIG. 4.** “General feedback about AIDA” portion of the survey questionnaire—asked various questions about what the user thought of the program. Key questions from this section have been applied in other surveys of AIDA version 4 users.<sup>30</sup>



forms (e.g., by e-mail or as hard copy by ordinary post/fax), and, where this could be reliably ascertained (e.g., from a covering e-mail note), the country of origin of the respondent.

Feedback forms were solicited and collected in a variety of ways. Some forms were submitted spontaneously by users of the software. Others may have received e-mails inviting them to submit their feedback forms. A relatively small number of AIDA users, who had been in contact with the AIDA authors and provided a postal address, were written to—enclosing a hard copy (printed) questionnaire form—and asked for their feedback.

It would take time to edit the feedback form text file, or even complete the form by hand, probably requiring 10–15 minutes. In order to encourage as many AIDA users as possible to submit their feedback, some users were offered a hard copy (printed) AIDA manual (Fig. 4a in Tatti and Lehmann<sup>31</sup>) via post in return for their feedback comments.

As will be apparent, the data collection process for what was effectively a pilot study was somewhat ad hoc; however, the overall aim was to obtain as wide a variety of feedback comments from as many different users of the software, as possible.

### *Analyses*

All categorical or quantitative data were entered into a Microsoft™ (MS) (Redmond, WA) Excel™ spreadsheet for summarising and analysis. Not all respondents answered all questions. Therefore percentages have been calculated on the basis of the total number of responses received to that particular question (the denominator). For some questions, where respondents could answer in more than one category, the total number of responses could come to more than 200—for example, when making “wish list” suggestions concerning possible enhancements to the software. To save space in the text, “don’t know,” “unsure,” or “not applicable” responses are not all listed in the Results section that follows.

All qualitative, free-text comments were entered into a MS Word™ file database for separate review and analysis.

## RESULTS

### *Survey population*

Feedback forms were collected over a 3-year 8-month period. Two hundred feedback forms were received during this time. Although there have been a large number of visits recorded at the AIDA Website—and downloads of the software—since the completion of the data collection phase of the study, up to the end of the data collection period there were in fact only 12,613 downloads of the AIDA program logged. This suggests that in the current pilot survey it was possible to obtain feedback from approximately 1.5% of the total number of AIDA downloaders, up to that time.

One hundred ninety-one of the 200 forms (95.5%) were returned by e-mail, while nine of 200 forms (4.5%) were returned by fax or post. Source countries could be identified for 102 of the forms. Forty-eight of these 102 forms (47.1%) came from the United States, 16 of 102 (15.7%) from the United Kingdom, seven of 102 (6.9%) from Germany, five of 102 (4.9%) from Italy, three of 102 (2.9%) each from Australia, the Netherlands, and India, and two of 102 (2.0%) each from France, Portugal, and Brazil, with one of 102 (1.0%) each from Russia, New Zealand, Canada, the Czech Republic, Sweden, Slovenia, Poland, Hong Kong, Turkey, China, and Switzerland.

One hundred six of the 209 responses (50.7%) received with this information came from people with diabetes, with other users including parents of individuals with diabetes (13 of 209, 6.2%), other relatives (23 of 209, 11.0%), doctors (28 of 209, 13.4%), nurses (20 of 209, 9.6%), diabetes educators (11 of 209, 5.3%), students (six of 209, 2.9%), and pharmacists (two of 209, 1.0%). Please note there were a number of respondents who fulfilled more than one of these end-user categories—hence the denominator >200. For example, there were a number of people with diabetes who were also doctors, nurses, or diabetes educators—who replied to this survey.

The mean ( $\pm$ SD) age of the 115 respondents who gave their age was  $42.6 \pm 17.6$  years.

Amongst the subgroup of individuals with diabetes, or who provided this information on

behalf of relatives with diabetes, two-thirds were people with insulin-dependent (type 1) diabetes (75 of 111, 67.6%), as compared with people with non-insulin-dependent (type 2) diabetes (36 of 111, 32.4%). The overall mean ( $\pm$ SD) duration of diabetes reported was 12.6 ( $\pm$ 11.4) years, whilst people with type 2 diabetes reported injecting insulin for a mean ( $\pm$ SD) duration of 10.8 ( $\pm$ 9.9) years, based on 51 responses.

#### General feedback

One hundred ninety-two of 199 respondents (96.5%) reported finding AIDA to be of interest as an educational tool. Only four of 199 people (2.0%) found it not of interest, whilst three of 199 (1.5%) were unsure. An overwhelmingly majority, 192 of 198 (97.0%), believed the program to be of use, and 186 of 199 (93.5%) expressed a desire to continue making use of the software.

In terms of the program's wider application, 157 of 198 (79.3%) respondents felt AIDA might be of interest to local/national diabetes associations, whilst 31 of 198 (15.7%) were not certain. A large proportion, 139 of 198 (70.2%), felt their health-carer/diabetes educator would be interested in the program, and 183 of 197 (92.9%) felt the software was worthy of wider distribution. One hundred forty-two of 197 respondents (72.1%) said they would inform other people about AIDA; however, 51 of 197 (25.9%) were not sure about this.

Thirty-eight of 188 (20.2%) of the survey participants reported having used diabetes self-

learning tools other than AIDA, although interestingly 150 of 188 (79.8%) of the respondents had not used any other self-education tools.

#### Utility of AIDA as a simulator

On specific questioning, 143 of 197 (72.6%) respondents did not perceive the program to be in any way unsafe, whilst 35 of 197 (17.8%) felt it could possibly be misused, and 19 of 197 (9.6%) said they were not sure. However, 180 of 198 (90.9%) users felt the caveats provided with the program made clear its limitations.

Ninety of 188 respondents (47.9%) had actually tried typing their own data into the program. Of these, 39 of 90 (43.3%) found the simulations matched what actually happened to their own BG levels. An additional four of 90 (4.4%) reported the simulations matched "sometimes," while for 35 of 90 (38.9%) the simulations did not match their own BG profiles.

One hundred five of 185 users (56.8%) understood the program was not intended for this purpose.

The results of the general feedback (third) section of the questionnaire (Fig. 4) are summarised in Tables 1 and 2. These data assess the possible educational benefits (Table 1) and limitations (Table 2) of the program, as perceived by the study respondents.

#### "Wish list" data

One hundred twenty-seven of 200 respondents (63.5%) suggested additional features

TABLE 1. OUTLINE OF ANSWERS TO GENERAL FEEDBACK SECTION OF THE QUESTIONNAIRE (FIG. 4) REGARDING POSSIBLE EDUCATIONAL UTILITY OF AIDA VERSION 4

Abbreviated question	Replied	Yes	No	Don't know/not applicable
Does AIDA have educational value?	199	192 (96.5%)	4 (2.0%)	3 (1.5%)
Have you found AIDA to be useful?	198	192 (97.0%)	2 (1.0%)	4 (2.0%)
Will you continue to use AIDA?	199	186 (93.5%)	8 (4.0%)	5 (2.5%)
Is AIDA likely to be of interest to local/national diabetes associations?	198	157 (79.3%)	10 (5.1%)	31 (15.7%)
Would your doctor/diabetes educator find AIDA of interest?	198	139 (70.2%)	22 (11.1%)	37 (18.7%)
Should AIDA be distributed more widely?	197	183 (92.9%)	5 (2.5%)	9 (4.6%)
Would you inform other people about AIDA?	197	142 (72.1%)	4 (2.0%)	51 (25.9%)

TABLE 2. OUTLINE OF ANSWERS TO GENERAL FEEDBACK SECTION OF THE QUESTIONNAIRE (FIG. 4) REGARDING POSSIBLE LIMITATIONS OF AIDA VERSION 4

Abbreviated question	Replied	Yes	No	Don't know/not applicable
Do you think AIDA could be in any way unsafe?	197	35 (17.8%)	143 (72.6%)	19 (9.6%)
Are AIDA's caveats/limitations clear?	198	180 (90.9%)	7 (3.5%)	11 (5.6%)
Have you tried entering your own blood glucose (BG) data into the program?	188	90 (47.9%)	27 (14.4%)	71 (37.8%)
If yes, did the simulations match your own BG profile?	90	39 (43.3%) 4 (4.4%) <sup>a</sup>	35 (38.9%)	12 (13.3%)
Have you understood that AIDA is not intended for individual patient BG prediction or therapy planning?	185	105 (56.8%)	10 (5.4%)	70 (37.8%)

<sup>a</sup>Matched sometimes.

they would like to see incorporated into future versions of the program. In total, 270 additional features were proposed by these users. Figure 6 shows a histogram of the number of survey respondents versus the number of wishes/requests made. As can be seen, 52 survey respondents made one suggestion each—with more suggestions made by other users—ranging up to seven suggestions that were made by just two users. The average number of requests/suggestions made per respondent was

2.1. Forty-one of 270 wishes (15.2%) were for an MS Windows™-based version of the program. Other technical enhancements that were suggested included 13 of 270 (4.8%) requests for a print facility to be incorporated into the program, and eight of 270 (3.0%) wishes for mouse support for the software.

Many of the requests addressed developments that might allow the program to simulate a wider range of clinical situations. These included 37 of 270 (13.7%) responses seeking to

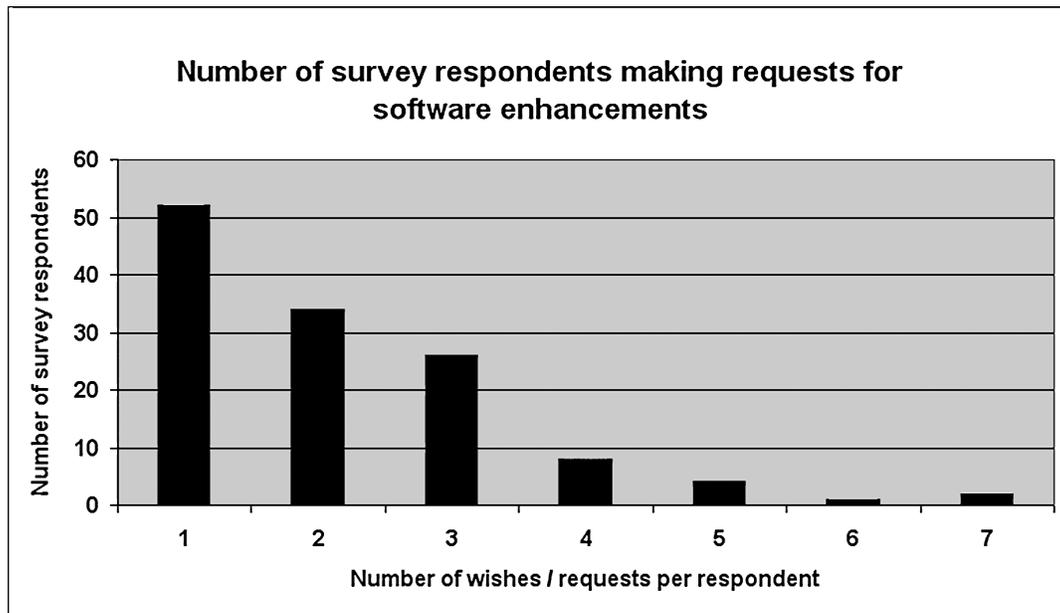


FIG. 6. Graph showing the number of surveyed users who had "wish list" suggestions for enhancements to the AIDA version 4 software. In total, 127 respondents made 270 suggestions. Seventy-three of the 200 participants in the survey did not submit any suggestions or requests for enhancements.

add lispro/Humalog-like analogue insulins to the program. Other comments concerning insulin regimens came from 16 of 270 (5.9%) replies that asked to see pump usage incorporated, and five of 270 (1.9%) requests that wanted greater flexibility to allow more insulin types per regimen.

A number of respondents felt that it would be useful to include other variables affecting BG levels in the program. For instance, 32 of 270 wishes (11.9%) were for the effects of exercise to be incorporated, five of 270 requests (1.9%) were to be able to input other foods besides carbohydrates, and four of 270 responses (1.5%) called for the program to take into account the effects of stress.

The issue of non-insulin-dependent (type 2) diabetes was also touched upon in seven of 270 (2.6%) replies, which sought that the program should simulate this type of diabetes, including endogenous insulin secretion, and eight of 270 (3.0%) of wishes were to simulate the effects of oral hypoglycaemic tablets, as well as insulin.

While this "wish list" section analysis has concentrated on reporting the most commonly requested new features (Table 3)—there were a wide range of other novel features that users appeared keen to see added to the program (numbers of requests shown in parentheses). These other "wish list" features requested included facilities to: simulate larger numbers of meals and injections ( $n = 6$ ), provide more explanations/instructions ( $n = 5$ ), calculate glycosylated haemoglobin values for the simulations ( $n = 4$ ) (since provided),<sup>32</sup> allow paediatric simulations of insulin dosages  $<1$  unit ( $n = 4$ ), provide a simplified version of the pro-

gram ( $n = 4$ ), provide an Apple Mac and/or hand-held version of the program ( $n = 3$ ), simulate larger maximum meal sizes ( $n = 3$ ), run simulations over longer periods of time ( $n = 3$ ), simulate the effects of intercurrent illnesses ( $n = 3$ ), and specify the glycaemic index for foods ( $n = 3$ ).

Further requests were to switch the entered/displayed weight between pounds and kilograms ( $n = 2$ ), allow the download of data from a BG meter ( $n = 2$ ), provide an option to ignore/accept caveats ( $n = 2$ ), provide an alternative language version ( $n = 2$ ), display carbohydrate intake as bread equivalents as well as grams ( $n = 1$ ), simulate rapidly absorbed carbohydrate ( $n = 1$ ), integrate information into MS Office™ ( $n = 1$ ), provide a tutorial on why one simulation choice might be better than another ( $n = 1$ ), offer a facility to e-mail results for discussion and review ( $n = 1$ ), simulate body weights  $>99$  kg ( $n = 1$ ), and provide a CD-ROM version of the program ( $n = 1$ ).

Additional requests were to include a physiology section within the program ( $n = 1$ ), allow the user choice over what is seen on screen ( $n = 1$ ), provide a text explanation regarding BG control ( $n = 1$ ), allow batch operation of the simulator ( $n = 1$ ) (presumably for research purposes), allow mg/dL use for application in the United States ( $n = 1$ ), display graphs and data together ( $n = 1$ ), and allow larger injected doses of insulin ( $n = 1$ ) (AIDA version 4 is currently limited to maximum single doses of 40 units of any particular insulin preparation, although multiple injections can be made).

Because of limited space, not all wishes/requests are listed here.

TABLE 3. MOST COMMONLY SOUGHT NEW "WISH LIST" FEATURES FOR AIDA VERSION 4 REQUESTED BY STUDY PARTICIPANTS (QUESTION 11, FIG. 4)

<i>"Wish list" feature</i>	<i>Number seeking feature</i>	<i>Percentage of all "wish list" suggestions received (n = 270)</i>
Windows version of program	41	15.2%
Humalog/lispro	37	13.7%
Exercise	32	11.9%
Insulin pump	16	5.9%
Type 2 diabetes and oral hypoglycaemic tablets	15	5.6%
Print facility	13	4.8%

### *Computer skills*

One hundred ninety-six of the 200 respondents (98.0%) self-rated their computer skills: 56 of 196 (28.6%) respondents regarded themselves as "expert" with computers, 116 of 196 (59.2%) as "intermediate," and 24 of 196 (12.2%) as "novices." One hundred ninety-six of 197 (99.5%) users also reported having access to e-mail, and 196 of 198 (99.0%) respondents described having Internet access available to them.

### *Actual AIDA usage*

Automatic logging by the AIDA version 4 software was able to establish that 185 of the 200 respondents (92.5%) used AIDA on an average, median (interquartile range) of nine (12) occasions before responding to the survey with a median (interquartile range) of 25 (85) simulations being run by each respondent. This pilot questionnaire-based survey therefore documents feedback from AIDA version 4 users who between them used the program in total over 2,685 times and ran over 14,414 simulations. However, there was a very wide variation in usage by individuals—ranging up to 2,328 simulations run by just one respondent. Non-parametric statistics have been calculated here because of the non-Gaussian distribution of these data.

Some sort of software problems were experienced by 54 of 190 (28.4%) users out of the  $n = 200$  study group. However, only five of 190 (2.6%) of these reported an actual runtime error (program "crash"). One hundred thirty-six of 190 users (71.6%) reported no problems with the software, with 10 survey participants not responding to this question.

### *Machine configuration details*

The section of the questionnaire covering technical details (Fig. 2) concerned both software and hardware. It revealed that 193 respondents of the  $n = 200$  study cohort (96.5%) used various MS Windows operating systems [Windows '3.1 (five of 193, 2.6%), Windows '3.11 (13 of 193, 6.7%), Windows '95 (109 of 193, 56.5%), Windows 'NT (15 of 193, 7.8%), and Windows '98 (51 of 193, 26.4%)]. Most respon-

dents (161 of 186, 86.6%) reported using a Pentium PC, with 22 of 186 people (11.8%) using 80386/80486 PCs and three of 186 (1.6%) respondents using other computers. One hundred of 142 respondents (70.4%) reported running AIDA from within an MS Windows environment, while 26 of 142 users (18.3%) ran the program directly from DOS.

AIDA was run on a machine that was part of a network in 68 of 198 (34.3%) cases, although 127 of 198 (64.1%) users did not use a machine that was part of a network. Fifty-seven of 195 respondents (29.2%) reported using AIDA whilst network software operated in the background. Seventy-eight of 197 users (39.6%) ran AIDA while other (non-network) software was operating in the background.

Some of the technical data collected (Fig. 2) was only of historical interest—asked because the operation of components of the original AIDA version 4 program might have been affected by certain hardware configurations, which are now no longer of such importance.

The free-text comments received from respondents will be analysed and reported separately (manuscript in preparation).

## DISCUSSION

This study has established the feasibility of using a simple feedback form to survey a substantial number of diabetes software users. In addition, it has yielded interesting data in terms of who are the main users of the AIDA program, and has also provided technical (computer) information that has aided the release of a freeware upgrade to the software.<sup>32</sup> As such, this detailed, questionnaire-based, post-release feedback survey of 200 AIDA users complements previous surveys concerning AIDA version 4 that have been run via the Internet at the point of software download.<sup>23-27</sup>

In general, users in the current survey reported finding the program to be of educational value. The majority also seemed to feel that it would be of interest to diabetes educators and people with diabetes. Most were clear about its limitations as a simulator-based learning tool. A relatively high level of user satisfaction was described by study respondents.

However, there is very little experience in the literature about the evaluation of diabetes software programs, and especially about how educational diabetes simulators should be assessed, and feedback obtained from users.<sup>28,29</sup> It is hoped that a post-release survey approach—such as that described here—may serve as a useful paradigm for other medical programs that need evaluation and assessment, and that the experience gained from this  $n = 200$  pilot study may help to guide other researchers when planning how to evaluate their own software programs.

In Part 2 of this column (manuscript in preparation), some of the qualitative and free-text feedback comments received from the  $n = 200$  survey participants will be reviewed, and the implications of this pilot study will be discussed more fully.

#### ACKNOWLEDGMENTS

The authors would like to thank the 200 AIDA users who took the time and trouble to provide their feedback, and respond to this survey.

#### REFERENCES

1. Lehmann ED, Deutsch T, Broad D: AIDA: An Educational Simulator for Insulin Dosage and Dietary Adjustment in Diabetes. London: British Diabetic Association, 1997.
2. Lehmann ED, Deutsch T: A physiological model of glucose-insulin interaction. *IEEE EMBS Proc* 1991;13:2274–2275.
3. Lehmann ED, Deutsch T: AIDA<sup>2</sup>: A Mk. II automated insulin dosage advisor. *J Biomed Eng* 1993;15:201–211.
4. Lehmann ED: Experience with the Internet release of AIDA v4—an interactive educational diabetes simulator. *Diabetes Technol Ther* 1999;1:41–54.
5. Berger M, Rodbard D: Computer simulation of plasma insulin and glucose dynamics after subcutaneous insulin injection. *Diabetes Care* 1989;12:725–736.
6. Lehmann ED, Deutsch T: A physiological model of glucose-insulin interaction in type I diabetes mellitus. *J Biomed Eng* 1992;14:235–242.
7. Sivitz WI, Davidson PC, Steed D, Bode B, Richardson P: Computer-assisted instruction in intense insulin therapy using a mathematical model for clinical simulation with a clinical algorithm and flow sheet. *Diabetes Educ* 1989;15:77–79.
8. Hedbrant J, Ludvigsson J, Nordenskjold K: Sarimner: a computer model of diabetes physiology for education of physicians and patients. *Diabetes Res Clin Pract* 1991;14:113–122.
9. Rutscher A, Salzsieder E, Fischer U: KADIS: model-aided education in type I diabetes. *Comput Methods Programs Biomed* 1994;41:205–215.
10. Albisser AM, Schulz M: Simulating human intermediary metabolism: OMNI et al. In: Marks V, Alberti KGMM, eds. *Clinical Biochemistry Nearer the Patient II*. London: Bailliere Tindall, 1986;59–67.
11. Cobelli C, Nucci G, Del Prato S: A physiological simulation model of the glucose-insulin system. In: Blanchard SM, ed. *Proceedings of the First Joint BMES/EMBS Conference: Serving Humanity, Advancing Technology*. Piscataway, NJ: IEEE, 1999;999.
12. Lehmann ED, Hermanyi I, Deutsch T: Retrospective validation of a physiological model of glucose-insulin interaction in type 1 diabetes mellitus. *Med Eng Phys* 1994;16:193–202. [Erratum in *Med Eng Phys* 1994;16:351–352.]
13. Lehmann ED, Deutsch T: Computer assisted diabetes care: a 6 year retrospective. *Comput Methods Programs Biomed* 1996;50:209–230.
14. Lehmann ED, Deutsch T: Compartmental models for glycaemic prediction and decision-support in clinical diabetes care: promise and reality. *Comput Methods Programs Biomed* 1998;56:193–204.
15. Lehmann ED: Interactive educational simulators in diabetes care. *Med Inform* 1997;22:47–76.
16. Lehmann ED: Preliminary experience with the Internet release of AIDA—an interactive educational diabetes simulator. *Comput Methods Programs Biomed* 1998;56:109–132.
17. Lehmann ED: User experience with the AIDA interactive educational virtual diabetes patient simulator. *Diabetes Technol Ther* 2000;2:165–171.
18. Wilson DM: Diabetes simulators: ready for prime time? *Diabetes Technol Ther* 1999;1:55–56.
19. Lehmann ED: Spontaneous comments from users of the AIDA interactive educational diabetes simulator. *Diabetes Educ* 2000;26:633–643.
20. Lehmann ED: Short user comments ('sound bites') regarding usage of AIDA v4—<http://www.2aida.org>—an interactive educational diabetes simulator. *Diabetes Technol Ther* 2000;2:663–666.
21. Tatti P, Lehmann ED: A randomised-controlled clinical trial methodology for evaluating the teaching utility of interactive educational diabetes simulators. *Diabetes Nutr Metab* 2001;14:1–17.
22. Tatti P, Lehmann ED: A prospective randomised-controlled pilot study for evaluating the teaching utility of interactive educational diabetes simulators. *Diabetes Nutr Metab* 2003;16:7–23.
23. Lehmann ED: The freeware AIDA interactive educational diabetes simulator—<http://www.2aida.org>—(1) A download survey for AIDA v4.0. *Med Sci Monit* 2001;7:504–515.

24. Lehmann ED: Who is downloading the freeware AIDA v4.3 interactive educational diabetes simulator? An audit of 2,437 downloads. *Diabetes Technol Ther* 2002;4:467-477.
25. Lehmann ED: Who is downloading the free AIDA v4.3a interactive educational diabetes computer software? A 1-year survey of 3,864 downloads. *Diabetes Technol Ther* 2003;5:879-890.
26. Lehmann ED: Why are people downloading the freeware AIDA diabetes computing software program: a pilot study. *Diabetes Technol Ther* 2002;4:793-808.
27. Lehmann ED: Why people download the freeware AIDA v4.3a diabetes software program: a proof-of-concept semi-automated analysis. *Diabetes Technol Ther* 2003;5:477-490.
28. Biermann E, Mehnert H: DIABLOG: a simulation program of insulin glucose dynamics for education of diabetics. *Comput Methods Programs Biomed* 1990;32:311-318.
29. Hedbrant J, Ludvigsson J: Use of computer simulator training in the education of diabetic teenagers. *Pract Diabetes Int* 1995;12:18-21.
30. Tatti P, Lehmann ED: Utility of the AIDA diabetes simulator as an interactive educational teaching tool for general practitioners (primary care physicians). *Diabetes Technol Ther* 2001;3:133-140.
31. Tatti P, Lehmann ED: Using the AIDA—[www.2aida.org](http://www.2aida.org)—diabetes simulator. Part 1: Recommended guidelines for health-carers planning to teach with the software. *Diabetes Technol Ther* 2002;4:401-414.
32. Lehmann ED: The freeware AIDA interactive educational diabetes simulator—<http://www.2aida.org>—(2) Simulating glycosylated haemoglobin (HbA<sub>1c</sub>) levels in AIDA v4.3. *Med Sci Monit* 2001;7:516-525.

Address reprint requests to:

*Dr. Eldon D. Lehmann*  
*c/o [www.2aida.org](http://www.2aida.org) Diabetes Simulator*  
*Development Team*  
*P.O. Box 46104*  
*London, EC2Y 8WN, UK*

*E-mail: [www@2aida.org](mailto:www@2aida.org)*

*Web: [www.2aida.org/lehmann](http://www.2aida.org/lehmann)*