

## Diabetes Information Technology & WebWatch

### Diabetes Website Review: [www.2aida.org](http://www.2aida.org)

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#### ABSTRACT

Previous Diabetes Information Technology & WebWatch columns have addressed the use of diabetes simulators, and, in particular, aspects of the AIDA software. AIDA is a freeware computer program, which simulates the interaction of carbohydrates and insulin administered in people with insulin-dependent (type 1) diabetes mellitus. The program is intended to be used as an educational support tool, and is available via the Internet without charge from [www.2aida.org](http://www.2aida.org). In this article, the AIDA Website is described and reviewed in terms of both content and functionality. This popular non-commercial Internet site provides free access to a downloadable PC version of AIDA, as well as access to a Web-based version of the simulator that can be run online (accessible directly at: [www.2aida.net](http://www.2aida.net)). User feedback suggests that the Website and the AIDA software have been of significant interest and value to many patients, their relatives and carers, students, and a variety of health-care professionals and researchers. The interactive and dynamic nature of the simulations adds a real-life dimension to the Web-based educational material, and the software is complemented by a substantial amount of supporting information at the Website. The on-going collection of subjective feedback continues to provide anecdotal evidence of the utility of the software, and this will hopefully be corroborated by results from more formal and objective evaluations. The future potential of diabetes simulators, in both education and research, is becoming increasingly apparent, and the AIDA Website is evolving accordingly.

#### INTRODUCTION

**T**HE AIDA WEBSITE (at: [www.2aida.org](http://www.2aida.org)) is an independent, non-commercial site that hosts downloads of the AIDA diabetes simulation software (Fig. 1). AIDA is a freeware com-

puter program that enables the interactive simulation of plasma insulin and blood glucose levels for educational purposes.

A number of previous publications, including Diabetes Information Technology and WebWatch columns, have described aspects of

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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 AIDA online, and Webmaster of the [www.2aida.org](http://www.2aida.org) and [www.2aida.net](http://www.2aida.net) Websites.

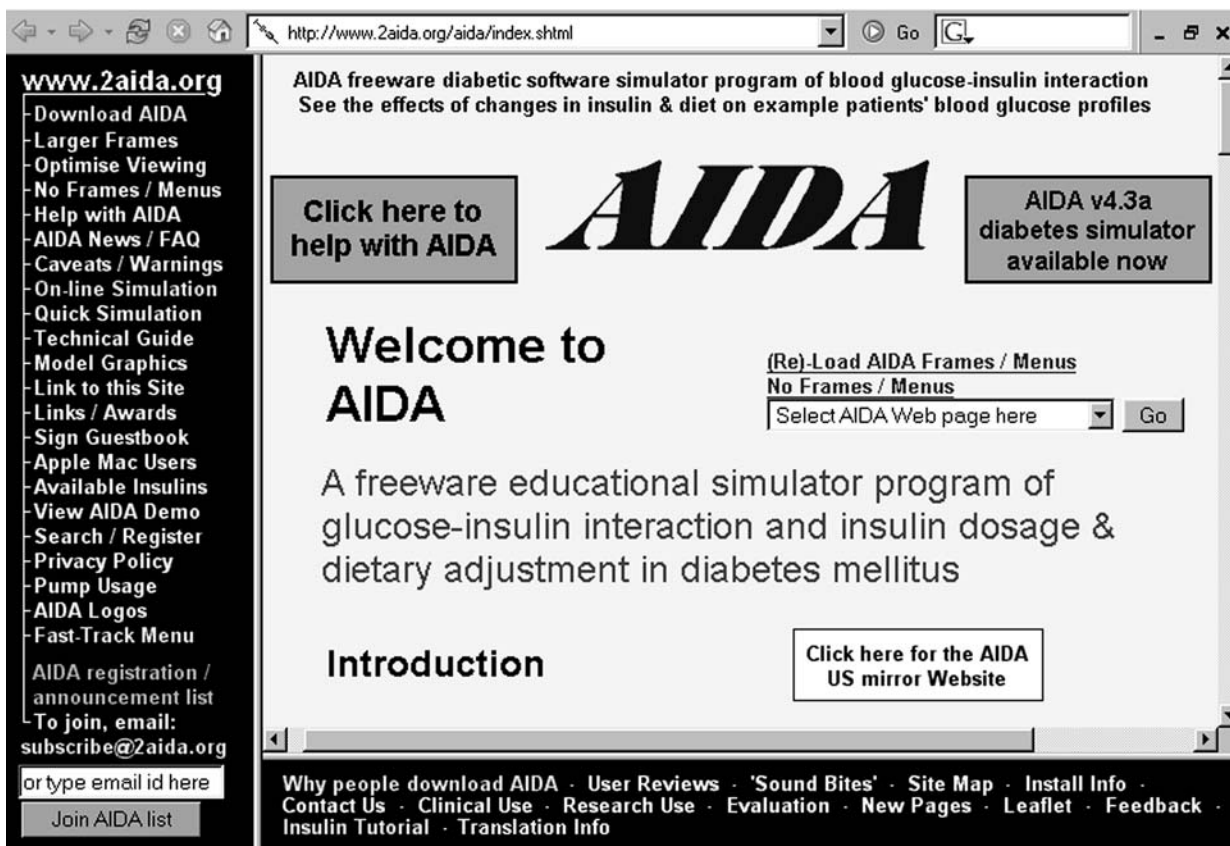


FIG. 1. AIDA Website (www.2aida.org) home page showing the left and bottom menu (frame) bars for site navigation. A link to the AIDA U.S. mirror site (accessible directly at: www.2aida.net/welcome) is also provided.

AIDA, such as its development,<sup>1-3</sup> its use,<sup>4</sup> its possible clinical utility as a teaching tool,<sup>5-7</sup> and its potential use in research.<sup>8,9</sup> User feedback has also been documented.<sup>10-15</sup> In this article we review the AIDA Website, and highlight a number of its attributes, centred around the diabetes simulation software.

The site was initially developed with the primary purpose of making the AIDA software available free-of-charge via the Internet. Since the launch of the original AIDA Web pages in 1996, over 450,000 visits have been logged, and well over 90,000 copies of the program have been downloaded gratis. AIDA has attracted widespread international interest, with visits logged from more than 115 countries worldwide. The notion that AIDA holds appeal for patients, relatives, students, and health-care professionals alike is also supported by the wide range of Internet addresses recorded in the site log files, and from the user feedback that has been received, which is documented at the Website.

Some of the key events relating to the history and development of the Website are summarised in Table 1, and a number of its noteworthy features are highlighted in this article.

## WEBSITE STRUCTURE AND FUNCTION

The AIDA Website is well structured and easy to navigate. The various sections are clearly organised, and the main menus and links render all parts of the site easily accessible. The site does not use any complex Java™ scripts or Flash™ graphics, so even the most basic of browsers will be able to access the Website. A number of viewing options are available—such as larger frames (Fig. 2), or no frames (Fig. 3)—and these add to the user-friendliness of the site.

The main feature of the Website is undoubtedly the diabetes simulation software. The Website enables anyone with access to the In-

TABLE 1. HISTORY OF KEY DEVELOPMENTS AT THE AIDA WEBSITE

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March/April 1996	AIDA PC program first made available for beta testing by e-mail and on the Web at a UK-based diabetes Website
June 1996	AIDA v4.0 became available for general release as freeware software
August 1998	Following 8 months of beta-testing the Web-based diabetes simulator, AIDA online, was formally launched
October 1999	Due to continuing interest in AIDA, a dedicated registration/announcement e-mail list was set up, accessible now via: <a href="mailto:subscribe@2aida.org">subscribe@2aida.org</a>
July 2000	A new version of the PC AIDA software (AIDA v4.3) was released, containing a number of technical improvements
October 2000	AIDA Website was moved to its own dedicated Web address (at: <a href="http://www.2aida.org">www.2aida.org</a> )
July 2001	A U.S. mirror site for the AIDA Website was launched, hosted from Baltimore, MD at <a href="http://us.2aida.org">http://us.2aida.org</a>
August 2001	AIDA v4.3a placed on general freeware release
September 2001	AIDA online <sup>2</sup> (version 2) became available for general use. This updated version of the Web-based diabetes simulator incorporated HbA <sub>1c</sub> levels for the online diabetes simulations, and provided user-definable bounds or ranges on the blood glucose graphs
October 2001	Diabetes/Insulin Tutorial became available at the AIDA Website, accessible directly at: <a href="http://www.2aida.org/tutorial">www.2aida.org/tutorial</a>
July 2002	AIDA U.S. mirror site moved to a new, larger, faster facility in California with considerably greater bandwidth (at: <a href="http://www.2aida.net/welcome">www.2aida.net/welcome</a> )

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ternet to download AIDA free-of-charge. The downloadable version of AIDA was primarily designed for IBM-compatible personal computers (PCs), but it has also been shown to work on Apple Macintosh (Mac) computers running PC emulation software (Fig. 4).

The Website also hosts an online Web-based version of the simulation program, called AIDA online (accessible directly at: [www.2aida.net](http://www.2aida.net)), which is an attractive alternative for many people. In theory, the online simulator can be accessed from any computer, anywhere

in the world, provided the computer is connected to the Internet and has a suitable graphical display. Apple Mac users who do not have an appropriate PC emulator can also use AIDA online to run simulations for free in their Web browser window. Furthermore, AIDA online reportedly works well with WebTV. The introduction of the Web-based software, therefore, has inevitably widened the potential audience for the AIDA diabetes simulation approach.

The simulation software is accompanied by a wealth of supporting information and guides for its use. Indeed, the Website provides much more than just access to a diabetes simulator; there are over 200 Web pages of information, plus a whole series of portable document format (.pdf) articles. Table 2 outlines the organization of the principal content at the AIDA Website. Much of the informational content has been published elsewhere in the scientific literature in various forms.<sup>1-17</sup> However, collectively the software and accompanying information form an integrated and cohesive unit, and the Website functions well as a dynamic entity.

### USING THE AIDA SIMULATOR

#### *Main features of AIDA*

The main features of AIDA are common to both the downloadable and online versions of the software. Simulation parameters—which can be changed—and other options are explained briefly in simple terms for the non-clinical user; these are the data that the model uses to help simulate the insulin-carbohydrate interactions and blood glucose responses.

AIDA comes complete with 40 case scenarios that can be run, adapted, and modified to suit the user. Examples of running simulations using these case scenarios have been described previously elsewhere.<sup>4</sup> In addition to the case scenarios provided with the software package and online simulator, users can define their own case scenarios, if desired.

A knowledge-based system has also been incorporated into AIDA in order to identify potential problems in the observed blood glucose data. A list of possible suggestions is generated, which can provide a basis for further simulations.<sup>2,3</sup>

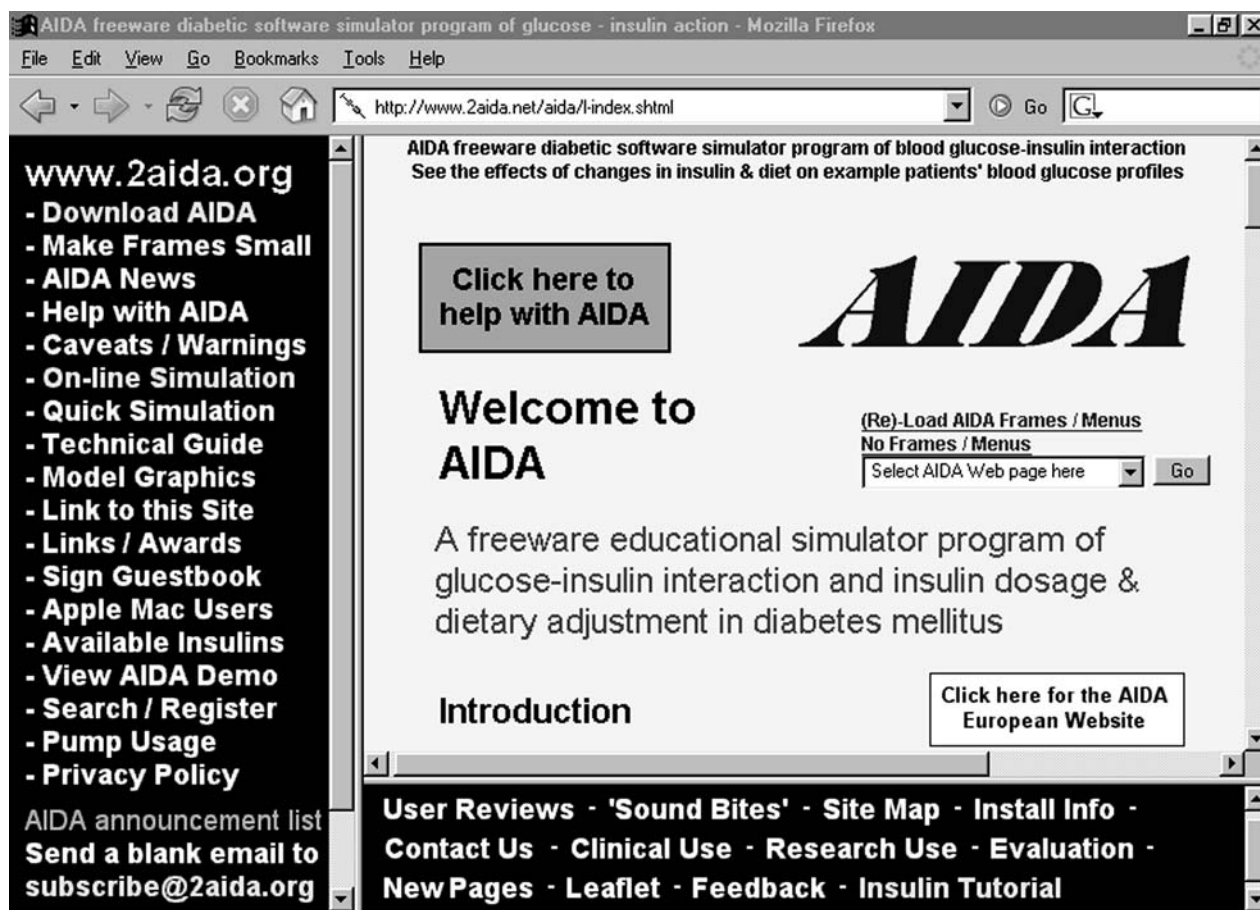


FIG. 2. Larger frames version of the AIDA site menus providing easier Website navigation for visitors with sight difficulties. This screenshot is from the AIDA U.S. mirror site, including a link back to the AIDA European Website at: [www.2aida.org](http://www.2aida.org) hosted from London, UK.

### Running the downloadable version of AIDA

There are numerous links throughout the Website inviting visitors to download the latest version of AIDA (v4.3a). The download process is fast, and the self-extracting installation file (file size approximately 1 Mb), when executed, installs the DOS (Disk Operating System)-based software in a matter of minutes.

In essence, using the DOS-based software is straightforward—users select or change data parameters and press the escape key to view graphical representations of insulin regimen and carbohydrate intake, the resulting simulated blood glucose levels, and a computed haemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>) value. Pressing the escape key again returns to the data entry form. The electronic user guide provided with the AIDA package contains a handy quick start guide, and the demonstration version also pro-

vides a useful introduction to the scope and capabilities of the software. The demonstration walks users through the first of the case scenarios and goes some way to help bridge the gap between the DOS-based and Web-based simulations. User experience of the PC software has previously been described elsewhere.<sup>10,11,13-15</sup>

### Running AIDA online

The Web-based version of the diabetes simulator—called AIDA online—can be accessed from the “On-Line Simulation” link on the left-hand main menu (or directly at: [www.2aida.net](http://www.2aida.net)). Standard Web browser software is employed—using a mouse to navigate—and this is perhaps more familiar to many people than the key and tab functions employed by the DOS-based PC software. The data for a selected pre-

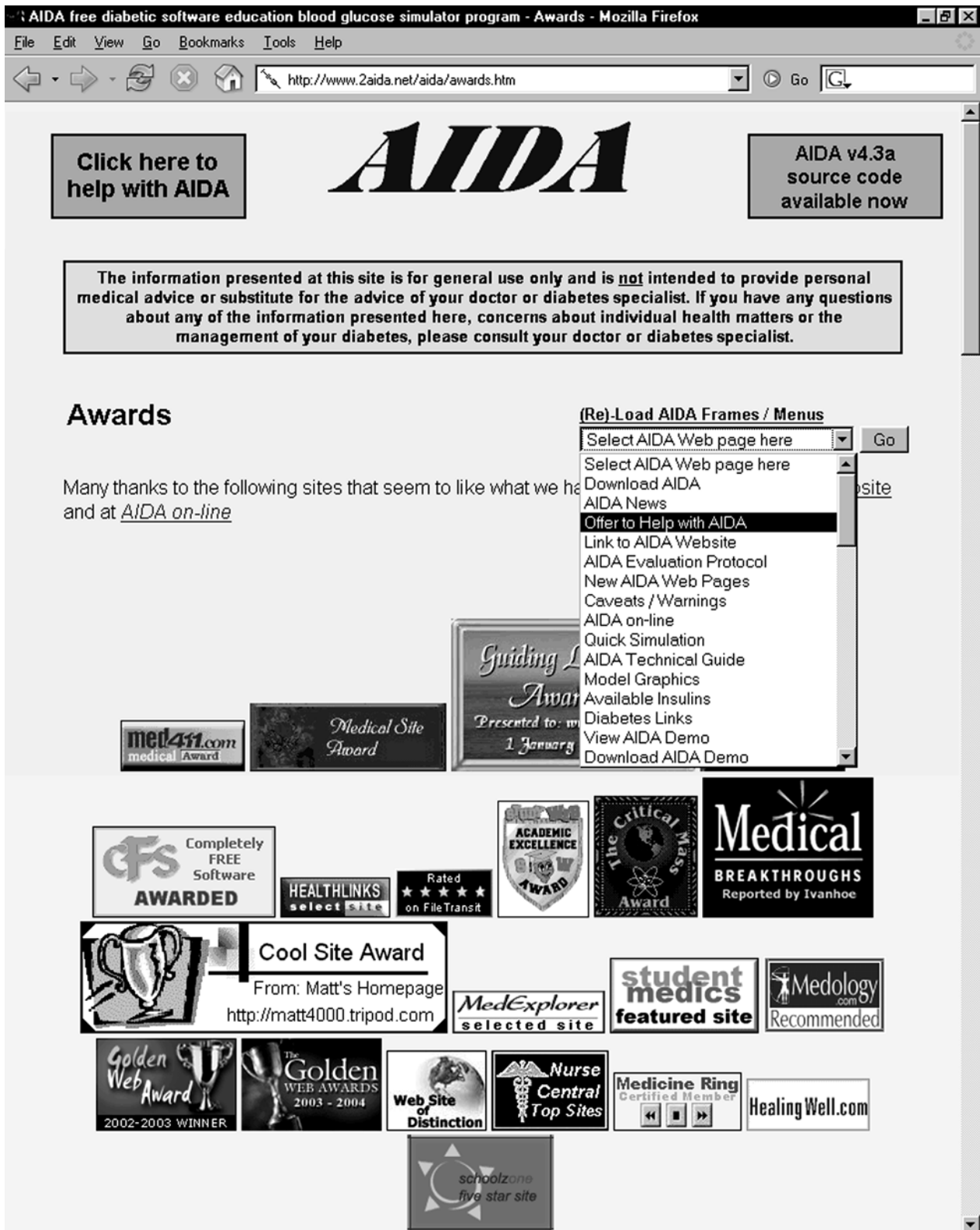
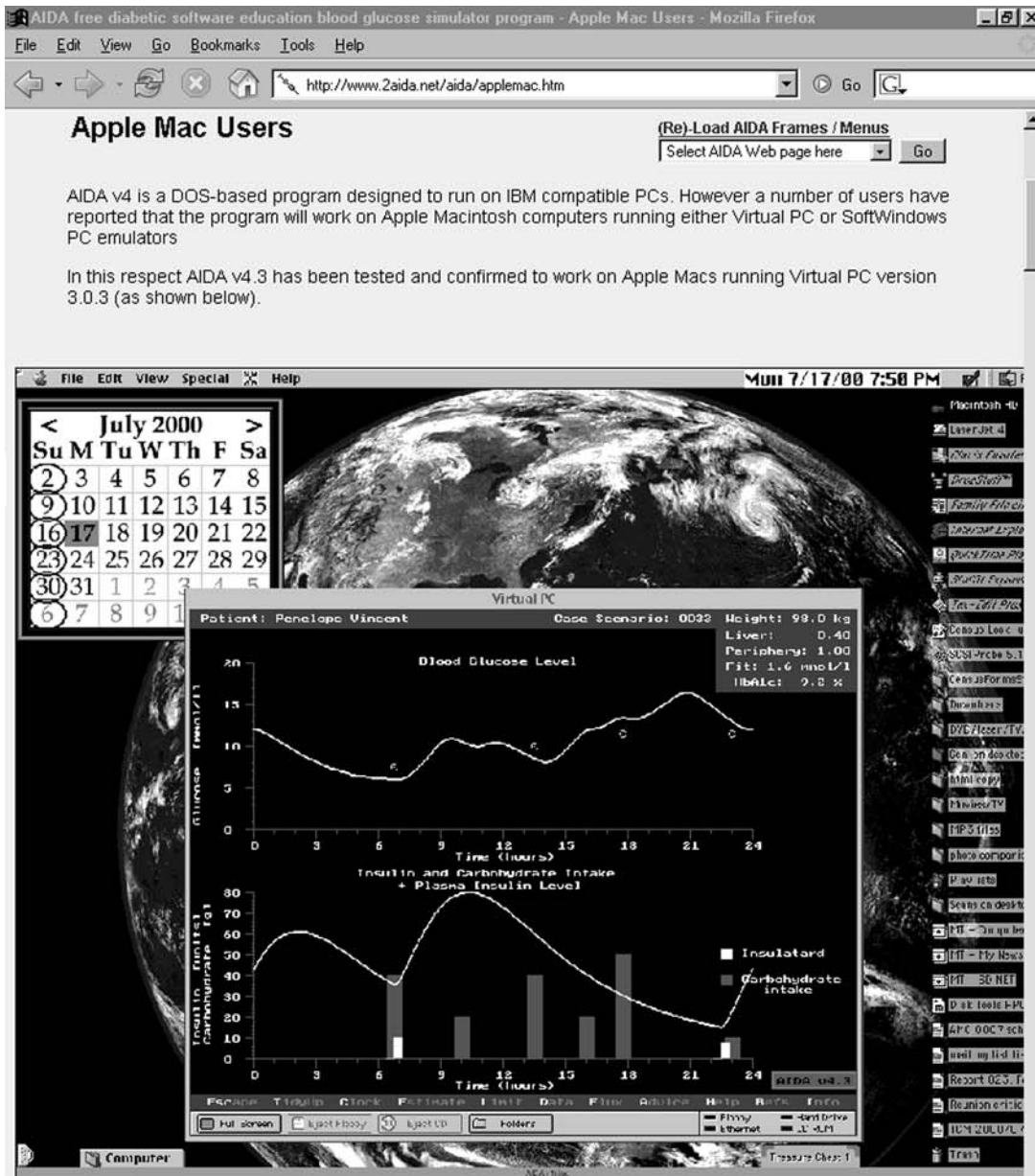


FIG. 3. No frames (menus) view of the AIDA Website showing some of the awards won by the AIDA and AIDA online sites. Navigation is facilitated by the pull-down menu on the upper right of the screen ("Select AIDA Web page here"). Making a choice and clicking on the (Go) button will display the selected Web page.



AIDA v4.3 has also been tested and confirmed to work on Apple Macs running SoftWindows '95 (version 4) - as shown below.



FIG. 4. Information for Apple Macintosh users showing examples of AIDA v4 operating with VirtualPC and SoftWindows personal computer emulation software.

TABLE 2. SUMMARY OF THE MAIN CONTENT OF THE AIDA WEBSITE (WWW.2AIDA.ORG)

Using the Website	Optimise viewing—frames options AIDA News Frequently asked questions (FAQ) Site map Search facility
Using AIDA	Caveats/warnings Download PC software Installation information On-line simulation About AIDA online How AIDA online works Quick simulation Fast-track menu
Additional supporting information for health-care professionals and researchers	Available insulins Pump usage Diabetes/insulin tutorial Clinical use Research use Evaluation Publications (.pdf format) Technical guide Model graphics
Communication between website developers and end users	Register to receive e-mail updates Guestbook comments Help with AIDA Why people download AIDA User reviews “Sound bites”
Other miscellaneous Web pages	Information for Apple Macintosh Users Leaflet/flyer briefly describing AIDA Privacy policy

stored case scenario can be automatically loaded as a starting point. Running the simulation (i.e., clicking on the run simulation button) yields a number of graphs depicting plasma insulin and blood glucose levels in relation to the insulin regimen and dosing, and timing and quantity of carbohydrates consumed. Other changeable parameters, such as insulin sensitivity, renal function, body mass, and so on, are taken into account by the simulation model. The data entry form is returned on the same page, so that further modifications can be made to the scenario, and the simulation re-run. Usefully, previous simulations are indicated on the graphs, so that the effects of the changes that have been made can easily be seen. As with the downloadable software, an HbA<sub>1c</sub> value is also computed, giving an overall indication of improvement (or otherwise!) of blood glucose control in the simulated patient.

The “Quick Simulation” option in the main menu guides the user through the first case sce-

nario and provides a useful introduction to the workings of the online simulation software. Introductory graphics are explained, and illustrate the case scenario with blood glucose level and carbohydrate intake on one graph, and insulin level, with insulin dose and timing, and insulin type, indicated on a second graph; this is essentially the baseline simulation. The additional commentary and suggestions help orientate the first-time user with the software and also help to direct the necessary thought processes. A variety of user reviews of AIDA online have been published elsewhere,<sup>12</sup> as have further details about how AIDA online actually works.<sup>18</sup>

Selecting “Fast-Track Menu” from the main menu takes the user to a series of further example simulations in which the baseline simulation has already been performed. The menu provides links to 14 selected case scenarios that also link in with the diabetes/insulin tutorial (see below).

## THE AIDA SIMULATION MODEL AND LIMITATIONS OF AIDA

AIDA has been developed using a pathophysiological compartmental model of insulin and carbohydrate (glucose) interaction.<sup>1,3</sup> The

model is described in detail in the technical guide at the Website (at: [www.2aida.org/technical](http://www.2aida.org/technical)), and is also depicted in pictorial and graphical forms in the "Model Graphics" section (Fig. 5). A basic knowledge of the assumptions and concepts underlying the model

The screenshot shows a web browser window displaying the AIDA website. The browser title is "AIDA free diabetic software education blood glucose simulator program - Human Model - Mozilla Firefox". The address bar shows "http://www.2aida.net/aida/manlabel.htm". The page features a large "AIDA" logo in the center. To the left of the logo is a button that says "Click here to help with AIDA". To the right is a box stating "AIDA v4.3a source code available now". Below the logo is a disclaimer: "The information presented at this site is for general use only and is not intended to provide personal medical advice or substitute for the advice of your doctor or diabetes specialist. If you have any questions about any of the information presented here, concerns about individual health matters or the management of your diabetes, please consult your doctor or diabetes specialist." Below the disclaimer is the heading "AIDA Model" and a "(Re)-Load AIDA Frames / Menus" button with a dropdown menu "Select AIDA Web page here" and a "Go" button. The main content area contains a paragraph of text and a human figure with numbered organs (1-6). The text describes the model's assumptions, including the lack of endogenous insulin secretion, glucose compartments, and various physiological processes like gastric emptying, insulin utilization, and glucose excretion. The human figure has numbers 1 through 6 pointing to different parts of the body: 1 (insulin injection site), 2 (pancreas), 3 (liver), 4 (brain), 5 (stomach/intestine), and 6 (lower body/periphery).

**AIDA Model** (Re)-Load AIDA Frames / Menus  
Select AIDA Web page here Go

Click on the numbers on the man figure below to see the individual organ functions

The AIDA model assumes a patient completely lacking endogenous insulin secretion (i.e. an insulin-dependent diabetic patient). It contains a single extracellular glucose compartment into which glucose enters via both intestinal absorption and hepatic glucose production. Glucose enters the portal circulation via first-order absorption from the gut; the rate of gastric emptying which provides the glucose flux into the small intestine being controlled by a complex process maintaining a relatively constant glucose supply to the gut during carbohydrate absorption. Glucose is removed from the extracellular space by insulin-independent glucose utilisation in the central nervous system (CNS) and red blood cells (RBC) as well as by insulin-dependent glucose utilisation in the liver and periphery. Hepatic and peripheral handling of glucose in the model are dealt with separately; the net hepatic glucose balance (NHGB) being computed as the sum of gluconeogenesis, glycogen breakdown and glycogen synthesis data derived for different blood glucose and insulin levels from nomograms in the medical literature. Glucose excretion from the extracellular space takes place above the renal threshold of glucose (RTG) as a function of the creatinine clearance rate (CCR). The only insulin input into the model comes from the absorption site following subcutaneous injection; the pharmacokinetics of insulin absorption being derived from descriptions of that process in the literature. The model contains separate compartments for plasma and 'active' insulin, the latter being responsible for glycaemic control while insulin is removed from the former by hepatic degradation. Insulin affects the NHGB characterised by a liver sensitivity parameter,  $S_h$ , as well as enhancing peripheral glucose utilisation described by a peripheral sensitivity parameter,  $S_p$ .

Alternative graphical representation of the AIDA model can be accessed [here](#) and [here](#)

FIG. 5. Graphical representation of the AIDA model. Clicking on any of the numbered organs on the man figure yields further information about that model organ function.

is helpful to understanding the limitations of the simulator, hence the warnings and caveats, and the associated disclaimer.

#### *Caveats and warnings*

The fact that certain caveats need to be read and understood is consistently reinforced throughout the Website (see: [www.2aida.org/caveats](http://www.2aida.org/caveats)) (Fig. 6). Essentially, these caveats are founded on the principles and underlying assumptions of the AIDA model, which is not sufficiently refined for individual patient simulation.<sup>16,17,19</sup> This is not surprising given the intricate complexities and diversity of human metabolism under any given set of circumstances. Therefore, AIDA is expressly for use as an educational tool, and not for generating individual therapeutic advice or treatment planning. Throughout the Website, patients are repeatedly encouraged to consult with their health-care professional before making any changes to their own treatment regimen.

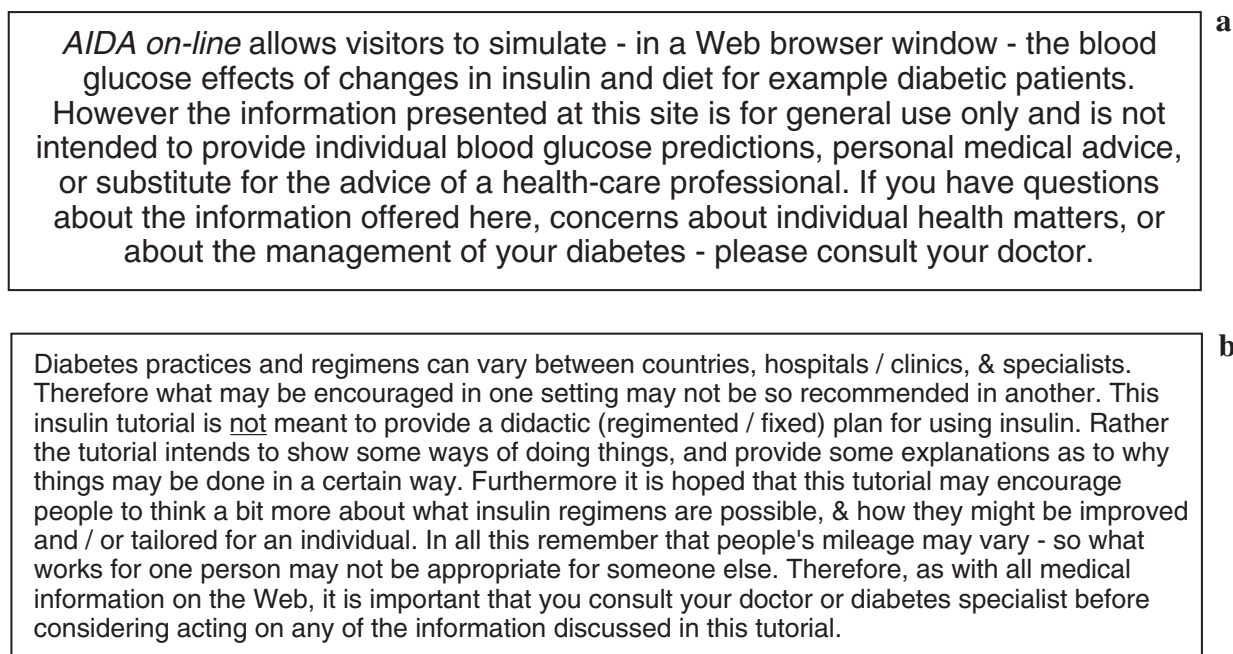
#### *Insulins covered by AIDA*

AIDA was originally developed before insulin analogues had become available. Al-

though the insulins listed in the “Available Insulins” section cover a broad range, the rapid-acting insulin analogues, such as Humalog (insulin lispro) and Novorapid (insulin aspart), and the longer-acting basal insulin glargine (Lantus) are not yet incorporated into the current simulation model. Website visitors are invited to join the low-volume AIDA registration/announcement list—by sending a blank e-mail to: [subscribe@2aida.org](mailto:subscribe@2aida.org)—to be informed when these insulins are added to the AIDA software.

#### *Insulin pump therapy*

Although the AIDA model does not explicitly cater for insulin pump usage, some users have described being able to gain useful information from the software by setting appropriate basal levels of insulin, and then adding in extra insulin boluses. Some of the suggestions that have been provided in feedback from insulin pump users have been reproduced at the site. This exemplifies the way in which user feedback is contributing to the value of the software and its continued development.



**FIG. 6.** Caveats/warnings provided at the AIDA Website: (a) AIDA online the Web-based diabetes simulator accessible directly at: [www.2aida.net](http://www.2aida.net) and (b) the Diabetes/Insulin Tutorial accessible directly at: [www.2aida.org/tutorial](http://www.2aida.org/tutorial).

The AIDA developers are currently working on a version of the software, which will enable more sophisticated pump regimens and protocols to be simulated.

### A SIMULATION-AIDED TUTORIAL

The diabetes/insulin tutorial, based in part on an introductory course for patients with insulin-dependent (type 1) diabetes,<sup>20</sup> is an interactive educational tool of potential value to patients and health-care students, and likely of interest to health-care professionals in education as well.

The tutorial, accessible directly at: [www.2aida.org/tutorial](http://www.2aida.org/tutorial), is a step-by-step guide, currently comprising four sections. It starts off with the basics, but soon progresses to in-depth considerations of various insulin and dietary treatment regimens. The first section looks at how different insulins can be used in the management of diabetes. It considers insulin regimens, and various types and combinations of insulin. The second section addresses “conventional” and “intensive” insulin therapy and dosage adjustment. The third section adds meal planning and carbohydrate counting, while the fourth section takes a look at glucose in the urine in relation to blood glucose levels, and illustrates the importance and utility of blood glucose monitoring as opposed to taking spot urine glucose measurements.

Whilst the user is working through the textual information pages, the diabetes simulator is run in a separate window. Therefore the user is able to create and work with the scenarios as described in the tutorial, whilst referring to the tutorial pages independently. Running simulations in parallel adds a unique interactive element that engages the user and helps to make the learning process more effective and enjoyable.

In addition, the dynamic and interactive nature of the tutorial emphasises the numerous possibilities for adapting insulin therapy to suit the individual—an important concept for patients, carers, and health professionals to appreciate—no insulin treatment regimen is set in stone. Again, the necessary caveats and warnings are emphasised to ensure that the information is used in an appropriate way.

### SPECTRUM OF USES OF AIDA

The potential uses of AIDA are numerous, and its widespread appeal is depicted by the user-generated feedback described in the sections entitled “Why people download AIDA” (accessible directly at: [www.2aida.org/why](http://www.2aida.org/why)), “User reviews” (at: [www.2aida.org/reviews](http://www.2aida.org/reviews)), and “Sound Bites.” These sections together enable Website visitors to get a flavour for the interest in, and utility of, the AIDA software.

#### *Personal use/self-learning tool*

As part of an on-going data collection process, people who download AIDA are asked to volunteer details about what they hope to be able to achieve with the software. The resultant comments, featured in the section entitled “Why people download AIDA,” suggest that many people with diabetes, and their relatives and carers, are hoping to learn more about insulin therapy and its possibilities, as it applies to their own circumstances.<sup>21,22</sup> In the vast majority of cases, the caveats appear to have been read and understood. Thus, although AIDA is suitable only as an educational tool, and should not be used for individual therapy planning, it is nevertheless considered a popular resource within the patient community.

Furthermore, although the diabetes simulator has been developed using a model of insulin-dependent (type 1) diabetes mellitus, in which insulin is totally lacking, it may still be of value to those people with non-insulin-dependent (type 2) diabetes, who wish to learn more about the dynamics of insulin therapy—as long as the underlying assumptions and associated caveats are understood.

#### *Clinical use*

Selected details of experience and feedback from health-care professionals that have been collected and published in the literature are reproduced at the Website (accessible directly at: [www.2aida.org/clinical](http://www.2aida.org/clinical)). These provide real examples of the clinical utility of the AIDA software. A number of health-care educators are incorporating AIDA into their teaching programs and have reported positive feedback from their students.

### *Research use*

The “Research Use” section of the Website (accessible directly at: [www.2aida.org/research](http://www.2aida.org/research)) illustrates some applied uses of AIDA as a data simulator in original research.<sup>8</sup> For example, AIDA has been used by others to generate data for the further development and testing of their own decision support prototypes.<sup>9</sup> As pointed out at the Website, using simulator-generated data has been described as removing “all the ethical and practical problems associated with collecting data from real patients,”<sup>23</sup> and provides a way of generating a large volume of data to train and evaluate other computer prototypes.

## EVALUATION

The Website developers have already collected a substantial amount of anecdotal evidence in terms of user experience, but this is subjective. In today’s era of evidence-based practice, it is appropriate that the clinical utility of the AIDA software be objectively demonstrated in randomised controlled trials (RCTs). The evaluation section of the Website ([www.2aida.org/evaluate](http://www.2aida.org/evaluate)) provides an outline prospective methodology for formally evaluating the educational utility of an interactive diabetes simulator, such as AIDA.<sup>24</sup>

A proof-of-concept, or pilot study, using the suggested protocol has already demonstrated the feasibility of using an RCT approach for the evaluation of educational diabetes simulation software such as AIDA,<sup>25</sup> and issues surrounding the use of such RCTs have been discussed elsewhere.<sup>26,27</sup> Larger-scale trials involving more patients in more centres are needed, and the Website clearly strives to engage health-care professionals in this activity.

## SUPPORTING INFORMATION

The Website contains a large number of Web pages of supporting information, plus free online access to a considerable number of papers that have been published in the medical and computing literature (the latter can be accessed via the “Research Use” section, or directly at: [www.2aida.org/articles](http://www.2aida.org/articles)).

The “Frequently Asked Questions” (FAQ) section—which can be accessed from the left-hand main menu and directly at: [www.2aida.org/faq](http://www.2aida.org/faq)—also provides a substantial amount of supplementary and interesting information concerning the Website, and the development and use of the AIDA diabetes simulator.

If visitors cannot find the information that they are looking for, then using the efficient search facility—again, accessed from the main menu, or directly at: [www.2aida.org/search](http://www.2aida.org/search)—will likely point them in the right direction.

For American, Australasian, Pacific, and Fast East Asian users of AIDA, a U.S. mirror site has been set up in California accessible directly at: [www.2aida.net/welcome](http://www.2aida.net/welcome).

## FUTURE DEVELOPMENTS

The AIDA software is effectively a prototype, or “work in progress,” and the on-going development is mirrored in developments at the Website, which is continually evolving. Visitors to the site are encouraged to contribute comments and feedback in relation to any of the Website features. Links to the AIDA feedback (at: [www.2aida.org/feedback](http://www.2aida.org/feedback)) and contact/guestbook forms (at: [www.2aida.org/guestbook](http://www.2aida.org/guestbook)) are numerous and can be found throughout the site, inviting visitors—patients and health-care professionals alike—to communicate views on the current use or potential further development of AIDA as an educational tool.

New insulins, exercise/stress levels, and many other features may be incorporated into future versions of AIDA. Software for insulin pump therapy has already been discussed. Interested users are invited to sign up to trial future beta releases of the AIDA software at the Website (at: [www.2aida.org/beta](http://www.2aida.org/beta)).

In all of the sections at the Website, visitors are also invited to register their general interest in the software, and join the e-mail notification list, which will keep them up-to-date with the latest developments. Further information is available at: [www.2aida.org/register](http://www.2aida.org/register). Registration is free, and the list volume is very low.

In addition, an open invitation exists for anyone who believes he or she may be able to help

with activities relating to the further development of the AIDA Website/software, and an independent "Help with AIDA" e-mail announcement list is in operation to facilitate this. Further information is available at: [www.2aida.org/help](http://www.2aida.org/help). To subscribe send a blank e-mail note to: [help@2aida.org](mailto:help@2aida.org).

As a relatively new feature the AIDA v4.3a Turbo Pascal source code that has been used to program the DOS-based diabetes simulator and knowledge-based system is being made freely available for download for non-commercial purposes via the AIDA Website. In this way the AIDA authors hope to foster the further development and enhancement of the diabetes simulation approach, particularly for research and educational use. Further information about this novel development can be found in Lehmann<sup>28</sup> and at [www.2aida.org/sourcecode](http://www.2aida.org/sourcecode) on the Web.

## DISCUSSION

Websites provide a convenient way of making educational information and tools available to a wide audience. The Internet is now awash with good diabetes information sites<sup>29</sup>; however, to a large extent educational materials available via the Internet tend to be in basic textual or graphical formats (such as slide presentations). In this respect, the AIDA Website stands out because it is both dynamic and interactive.

The last 2 decades have seen a considerable shift in the approach to insulin treatment regimens, aided by the availability of new insulin preparations and the remodelling of diabetes self-care. Education and training in insulin treatment approaches are now essential for all those involved in diabetes care.

The role of the AIDA Website in the educational setting is not to replace any current teaching materials, but, rather, to enhance existing methods. Understanding insulin treatment and becoming adept in working with insulin treatment usually require hands-on trial and error experience. However, it is not ideal to learn about diabetes treatment through experimentation in real-life because of the dangers of hypo- and hyperglycaemia and the long

time frames involved. The simulator provides a "virtual patient" concept, which adds a real-life dimension to Web-based and paper-based teaching materials and offers learning through experience, with the additional benefit of immediacy.

Increased use of tools such as AIDA in the health-care education setting may further help to change the clinical style of diabetes management from the traditional prescriptive fixed approach (to the insulin-diet regimen) to a more realistic and versatile one.

Poor computer literacy may be perceived as a possible potential barrier to the use of the DOS version of AIDA.<sup>10,30</sup> However, as far as computer software goes, it is the independent experience of one of us (K.R.) that AIDA is relatively easy to use, once its purpose is understood, and the accompanying electronic user guide is easy to read and understand. The on-line demonstrations and tutorials are also of great value in illustrating how the software can be applied.

Possibilities for the further development of diabetes simulators have previously been discussed elsewhere<sup>31,32</sup>; however, what can actually be achieved, validated, and evaluated may to a large extent depend on continued interest and collaboration of clinical colleagues, in addition to the necessary requirement of financial and time resources. In this respect, health-care professionals who are interested in receiving targeted announcements about educational and research uses of AIDA can join a very low volume e-mail list by sending a blank note to: [healthcarer@2aida.org](mailto:healthcarer@2aida.org). Further information is also available directly at: [www.2aida.org/healthcarers](http://www.2aida.org/healthcarers).

## CONCLUSIONS

The AIDA Website provides free access to a diabetes simulator and is of potential value to patients, their relatives and carers, students, and a variety of health-care professionals and researchers.

Simulators such as AIDA allow the reality of challenges facing blood glucose control to be modelled, and enable problem-solving skills to be developed in a virtual setting. AIDA pro-

vides both a teaching tool for health-care educators, and a learning aid for students and patients, their relatives, and carers. In addition to its clinical utility as an educational tool, AIDA also has great potential as a research tool.

The Website functions well and is user-friendly. It provides a stimulating educational resource, and we would recommend it to anyone with an interest in diabetes and insulin therapy.

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