

Research Use of the AIDA www.2aida.org Diabetes Software Simulation Program: A Review—Part 2. Generating Simulated Blood Glucose Data for Prototype Validation

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ABSTRACT

The purpose of this review is to describe research applications of the AIDA diabetes software simulator. AIDA is a computer program that permits the interactive simulation of insulin and glucose profiles for teaching, demonstration, and self-learning purposes. Since March/April 1996 it has been made freely available on the Internet as a noncommercial contribution to continuing diabetes education. Up to May 2003 well over 320,000 visits have been logged at the main AIDA Website—www.2aida.org—and over 65,000 copies of the AIDA program have been downloaded free-of-charge. This review (the second of two parts) overviews research projects and ventures, undertaken for the most part by other research workers in the diabetes computing field, that have made use of the freeware AIDA program. As with Part 1 of the review (*Diabetes Technol Ther* 2003;5:425–438) relevant research work was identified in three main ways: (i) by personal (e-mail/written) communications from researchers, (ii) via the ISI Web of Science citation database to identify published articles which referred to AIDA-related papers, and (iii) via searches on the Internet. Also, in a number of cases research students who had sought advice about AIDA, and diabetes computing in general, provided copies of their research dissertations/theses upon the completion of their projects. Part 2 of this review highlights some more of the research projects that have made use of the AIDA diabetes simulation program to date. A wide variety of diabetes computing topics are addressed. These range from learning about parameter interactions using simulated blood glucose data, to considerations of dietary assessments, developing new diabetes models, and performance monitoring of closed-loop insulin delivery devices. Other topics include evaluation/validation research usage of such software, applying simulated blood glucose data for prototype training/validation, and other research uses of placing technical information on the Web. This review confirms an unexpected but useful benefit of distributing a medical program, like AIDA, for free via the Internet—demonstrating how it is possible to have a synergistic benefit with other researchers—facilitating their own research projects in related medical fields.

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The AIDA software referred to in this report is an independent, noncommercial development which is being made available free-of-charge via the Internet—at a dot org (.org) not-for-profit Website—as a noncommercial contribution to continuing diabetes education. Dr. Lehmann is a co-developer of the AIDA diabetes simulator.

A common theme that emerges from the research ventures that have been reviewed is the use of simulated blood glucose data from the AIDA software for preliminary computer lab-based testing of other decision support prototypes. Issues surrounding such use of simulated data for separate computer prototype testing are considered further.

INTRODUCTION

THIS TWO-PART REVIEW is overviewing research applications of the AIDA www.2aida.org diabetes software simulation program. Part 1 of this review¹ focused mainly on testing decision support prototypes and training artificial neural networks using simulated blood glucose data from a diabetes simulator such as AIDA.

In this second part of the review issues surrounding dietary assessments, developing new diabetes models, and performance monitoring of closed-loop insulin delivery devices are considered. Attempts to try and apply a “learned space of parameter interactions” using simulated blood glucose data are overviewed. A business plan utilising telehealth-care technology within the home, and the development of a Web-based educational diabetes simulator are also considered. On-going research using AIDA is mentioned, and issues surrounding the generation of simulated blood glucose data for training/validation of other diabetes prototypes are discussed. Finally, evaluation/validation research with AIDA, and issues surrounding the placing of technical information on the Web are considered.

METHODOLOGY

As before¹ relevant research work for this review was identified in three main ways: (i) by e-mail/written communications from researchers who had made use of AIDA, (ii) via the ISI Web of Science citation database to identify published articles that referred to AIDA-related papers, and (iii) via searches on the Internet. Furthermore in a number of cases research students who had sought advice about AIDA, and diabetes computing in general, kindly provided copies of their research dissertations/theses upon the completion of their projects.

Some of the information described in this review has previously been made freely available on the Internet at www.2aida.org/aida/research2.htm, and selected researchers were directed to this Web page to check the accuracy of the basic material provided.

LEARNED SPACE OF PARAMETER INTERACTIONS USING SIMULATED BLOOD GLUCOSE DATA

A small group of researchers housed at the National Aeronautics and Space Administration (NASA) Independent Verification and Validation Facility (a software research lab that is now a division of Goddard Space Flight Center) has been engaged in utilising machine learning as an analysis technique. The goal of this work has been to provide importance hierarchies of parameters in determining changes in the model output.

The background to this work is the fact that high-profile satellite losses have highlighted NASA's need for quality software. The NASA Software Research Laboratory conducts applied research into advanced software analysis technologies, through tool development, case studies, and pilot projects.

The technique overviewed below, originally developed for software risk assessment, is, however, not limited to that domain. By incorporating other data/another model the researchers expect to be able to use the method in other areas. For instance, they are currently applying the approach to diet and insulin dosage adjustment planning for patients with diabetes. Using AIDA online (at www.2aida.org/online) to provide blood glucose data, they hope to learn the simplest actions that individuals with diabetes should be able to take to maintain their blood glucose at the correct level.

The researchers have presented their original technique with respect to a software proj-

ect risk model,² and are now seeking to extend their research into the diabetes domain, utilising the AIDA model.

Their original approach has been using mass simulation data in a Monte-Carlo style analysis of model behaviours which are learned by a standard Machine Learner technology. They then explore this learned space of parameter interactions to find importance hierarchies of parameters with respect to influencing changes in the output values.

In the original software project risk example this concerned such things as the influence of programmer experience on project risk. In terms of AIDA, or a diabetes model in general, it is hoped this may include such things as the influence of caloric intake at certain times of the day on levels/frequency of a type of insulin injection, or some other index measure. It is expected that what could result from a trusted model or data would be a general ranking of importance for the factors involved, aiding in resource/effort allocation in controlling or monitoring those factors.

Clearly a large amount of data is required for any information that is actually usable in a patient's regimen. In this respect the researchers have been using AIDA online to generate large quantities of simulated blood glucose data, and require more than 60,000 simulations to provide sufficient entries in their dataset to perform a stable machine learner summarisation with which to undertake their further analyses.

Three main steps are involved in the process, when applied to diabetes:

- (A) Collect blood glucose data or use a model to provide simulated values
- (B) Perform machine learning to convert the examples into an ensemble of decision trees
- (C) Use dedicated software to find mitigation strategies that change classifications (risk) in a majority of the decision trees.² In the diabetes domain it is hoped that step C will permit actions to be identified that may improve glycaemic control.

In the future the researchers hope to present a technique that may be utilised in the presence of lesser amounts of data, possibly allowing a patient to build his/her own personal analysis

model showing for that particular individual which factors seem to most strongly influence his/her symptoms.

PERFORMANCE MONITORING OF CLOSED-LOOP INSULIN DELIVERY DEVICES

Owens and Doyle³ have been addressing a different research question in diabetes. They have described using the Bergman minimal model⁴ and the AIDA model⁵ as virtual diabetic patients in their research on performance monitoring of closed-loop insulin delivery devices.

With closed-loop insulin delivery devices, as with any automated device, malfunction is possible. Hence the research issue that Owens and Doyle have been targeting is the fact that a measure of performance would be helpful to detect device failures that could violate hypoglycaemic and hyperglycaemic bounds for a patient.

Performance measures for the controller are an essential component of a closed-loop algorithm, to ensure safe operation.³ Intra-patient variability and faults due to insulin aggregation in the pump, sensor fouling, etc., are all conditions that can occur and affect pump controller performance.

For this work, the researchers have studied the Bergman and AIDA models in the standard Internal Model Control framework, using a first-order model for controller synthesis. They have tried to assess the effects of problems like insulin aggregation and sensor fouling on controller performance.³

While an Internal Model Control approach can provide adequate control of blood glucose levels using such a device, in a separate report the same authors have also described studying the use of a Model Predictive Control (MPC) approach.⁶ This technique apparently has an improved ability to handle the hypoglycaemic, hyperglycaemic, and insulin dosage constraints of such systems. Furthermore the use of MPC in a biological context has previously proved successful with applications in the field of anaesthetics. As a result of using a MPC approach it is reported that tighter control can be

obtained, limiting the effects of meals and other disturbances on glucose homeostasis.⁶

In a separate, but related, piece of work from the same group, Parker et al.⁷ have developed a model-based predictive control algorithm for blood glucose control in type 1 diabetic patients, using a closed-loop insulin infusion pump. Using compartmental modelling techniques a fundamental model of a patient with diabetes was constructed. The resulting nineteenth-order nonlinear pharmacokinetic-pharmacodynamic representation is used in controller synthesis. The mathematical representation of the meal (carbohydrate) submodel used for this work, was that developed for AIDA.⁵

A BUSINESS PLAN UTILISING TELEHEALTH-CARE TECHNOLOGY WITHIN THE HOME

Conmy⁸ has described a detailed business plan for utilising telehealth-care technology in the home. This is based on the premise of a diabetes nurse care manager in association with a primary care physician (general practitioner), and, with the assistance of AIDA, being able to manage patients' blood glucose levels.

This thesis (from 1999) for its AIDA work focuses exclusively on a single AIDA paper from 1994,⁹ which cites earlier validation work of a predecessor of the AIDA knowledge-based system (KBS). Unfortunately the thesis overlooks the fact that the AIDA model itself (separate from the KBS) is not accurate enough for individual patient glycaemic prediction or therapy planning. This is made clear at the AIDA Website (at www.2aida.org/caveats) and in the AIDA software as well as in a number of research publications from 1996 and 1998.^{10,11} It is for this reason that AIDA has only been made available for educational, demonstration, teaching, self-learning, and/or research purposes.

Connected with this, many researchers have hoped to be able to one day develop a computer system that might be able to assist in generating insulin-dosage adjustment advice. Indeed the literature¹²⁻¹⁵ and these reviews¹ are full of descriptions of prototypes attempting to achieve this. However, to date, producing a

computer program that can generate reliable, accurate medical advice—and which can explain/justify its reasoning¹⁶—has not proved so easy in the diabetes field. As such the financial planning described in the thesis⁸ might be considered slightly premature. Nevertheless it is highlighted here as another example of a research project that has reported heavy reliance on the AIDA software.

DIETARY ASSESSMENT

Yates and Fletcher¹⁷ from the University of Liverpool in England have focused on a different aspect of the diabetes "problem." They have studied three published models of the gut to assess how well they were able to predict the appearance of glucose following the ingestion of a carbohydrate meal. They found the AIDA model to give the best results of the models tested¹⁸—although it is recognised that carbohydrate content only forms one component of an ordinary meal.

Yates and Fletcher¹⁹ have also written in a more recent report that:

"The glycaemic response of an insulin-treated diabetic patient goes through many transitory phases, leading to a steady state glycaemic profile following a change in either insulin regimen or diet. Most models attempting to model the glucose and insulin relationship try to model the effect of oral or injected glucose rather than that from the digestion of food. However, it is clear that a better understanding of the glycaemic response would arise from consideration of intestinal absorption from the gut. It is assumed that this type of absorption can be modelled by a so-called glucose appearance function (systemic appearance of glucose via glucose absorption from the gut) predicting the glucose load from the food. Much research has been carried out in the areas of hepatic balance, insulin absorption and insulin independent/dependent utilization. However, little is known about intestinal absorption patterns or their corresponding glucose appearance profiles.

The strategy under investigation herein is to use deconvolution or backward engineering. By starting with specific results, i.e. blood glucose and insulin therapy, it is possible to work backwards to predict the glucose forcing functions responsible for the outcome. Assuming compartmental consistency, this will allow a clearer insight into the true gut absorption process. If successful, the same strategy can be applied to more recent glucose and insulin models to further our understanding of the food to blood glucose problem.¹⁹

The authors investigated the AIDA model of glucose–insulin interaction. As outlined previously, this model simulates the steady-state glycaemic and plasma insulin responses, independent of the initial values from which the simulation is started.⁵ Glucose enters the model via both intestinal absorption and hepatic glucose production. Yates and Fletcher¹⁹ considered a 70-kg male insulin-dependent diabetic patient with corresponding hepatic and insulin sensitivity parameters of 0.6 and 0.3, respectively. Net hepatic glucose balance was modelled piecewise by linear and symmetric functions. A first-order Euler method with a step size of 15 min was employed. For the simulation, only Actrapid® (Novo Nordisk) and NPH injections were considered. The injection of insulin and the glucose flux from the gut were started simultaneously to avoid any delay associated with gastric emptying.

The systemic appearance of glucose was compared from two viewpoints, not only to assess the strategic principle, but also to assess the suitability of the AIDA model. The first was a forward prediction using the compartmental structure. This analysis involved the rate of gastric emptying without time delay. The second was a backward prediction from experimentally observed blood glucose profiles. Investigations involved porridge, white rice, and banana containing the same carbohydrate content (25 g). Results obtained from the first analysis were dependent on the rate of gastric emptying, especially its ascending and descending branches. Results from the second analysis were dependent on the dose and type of insulin administered. Both predicted profiles showed

consistency with physiological reasoning, although it became apparent that such solutions could be unstable. Furthermore, both types of prediction were similar in structure and appearance, especially in simulations for porridge and banana. This emphasized the consistency and suitability of both analyses when investigating the compartmental accuracy and limitations within a model.

The new strategic approach was deemed a success, and the AIDA model was found to be “appropriate.” Yates and Fletcher¹⁹ suggested that a gastric emptying curve with a possible gastric delay is the way forward in regulating the appearance of glucose via gut absorption. However, it was apparent to these authors from their results that carbohydrate content is only one factor in carbohydrate absorption, and that to further improve realism further progress must inevitably involve other food characteristics and properties.¹⁹

DIABETES MODEL—FURTHER DEVELOPMENTS #1

Cobelli et al.²⁰ from the University of Padova in Italy are in the process of developing a new physiological model of glucose–insulin interaction in type 1 diabetes mellitus. This is intended to encompass newly acquired physiological knowledge about the time course of endogenous glucose production during a meal,²¹ and about the effect of glucose and insulin signalling on glucose utilisation.²² It is also meant to apply more accurate descriptions of the action profiles of insulin following subcutaneous injection.²³ As part of their testing procedure the researchers have been comparing the performance of their new model with other models of type 1 diabetes mellitus, including AIDA.^{5,20}

Furthermore the new Cobelli model is currently being extended to describe an insulin-dependent (type 1) diabetic patient. This is being done in order to provide a test bed for examining various data analysis techniques and control strategies,²⁴ in much the same way that other research projects highlighted in this review have been making use of AIDA.

DIABETES MODEL—FURTHER DEVELOPMENTS #2

As reported by Butler,²⁵ he together with Strachan and colleagues from the Robert Gordon University in Aberdeen, Scotland, UK have been working on a "Lifestyle Model" for insulin-dependent diabetic patients. AIDA is one of several models they are reviewing, with the eventual aim being to try and improve the control and quality of life of diabetic patients by developing an enhanced model of the processes that are known to affect diabetes mellitus.

DIABETES MODEL—FURTHER DEVELOPMENTS #3

Escreet²⁶ from Staffordshire University, U.K. has also reviewed the AIDA program, as part of work to develop a more comprehensive diabetes model. As well as critiquing the application, he wrote:

"AIDA is an extremely useful blood glucose simulation tool that contains a wealth of information for the user. The large number of example cases with full descriptions should be enough to get the user familiar with how to use the program as well as imparting further, more practical knowledge of how the glucose-insulin reaction works within the body."²⁶

Escreet²⁶ attempted to enhance the AIDA simulation approach by the addition of glycaemic indices for foods and by taking exercise into account, the aim being to provide a more comprehensive model of glucose-insulin interaction in diabetes. Such enhancements to the model are of some importance, but in practice they are not without their difficulties. For instance, the glycaemic index is a parameter that works quite well for single foods. However, when one tries to combine foods into meals the process becomes much more complex, and the parameter less useful in practice. Similarly with exercise—quantifying the level of activity can be quite problematical—unless one goes for a

relatively simple qualitative representation with low, medium, and high levels of exertion. Further research to address these issues is clearly required.

WEB-BASED DIABETES SIMULATOR: AIDA ONLINE

One of the most successful research projects to date involving AIDA has been the development of a Web-based interactive educational diabetes simulator. This resulted from an approach by two students at North Carolina State University (Raleigh, NC), who had been set as a senior bioengineering design project to create a simulator of glucose-insulin interaction on the Web. After rather more effort than normally goes into such a project AIDA online was produced,²⁷ with the system first going live on the Web in December 1997. This can be accessed directly at www.2aida.org/online and permits AIDA's interactive diabetes simulations to be run from anywhere in the world—from any computer platform (Mac, PC, Linux, UNIX server, etc.)—provided it is connected to the Internet and has a graphical display. Users have even reported feedback using AIDA online via Web-TV. AIDA online offers a familiar mouse/Windows graphical user interface—all interactions taking place via a standard Web browser window. The service is fast to use. Running a simulation from a computer in Seattle, WA (with the server residing in London, UK) usually only takes 1–2 s. Further information about this development can be found elsewhere in this journal.²⁷ Figure 1 summarises the basic structure of the AIDA online system.²⁸ Since logging of the number of simulations was started in August 1998, over 200,000 diabetes simulations have been run at AIDA online.

ON-GOING RESEARCH USING AIDA

Various other research projects involving AIDA are currently underway, although these have not yet reported their results. Nevertheless from its release to other researchers on diskette in 1992–1993—and on the Internet in

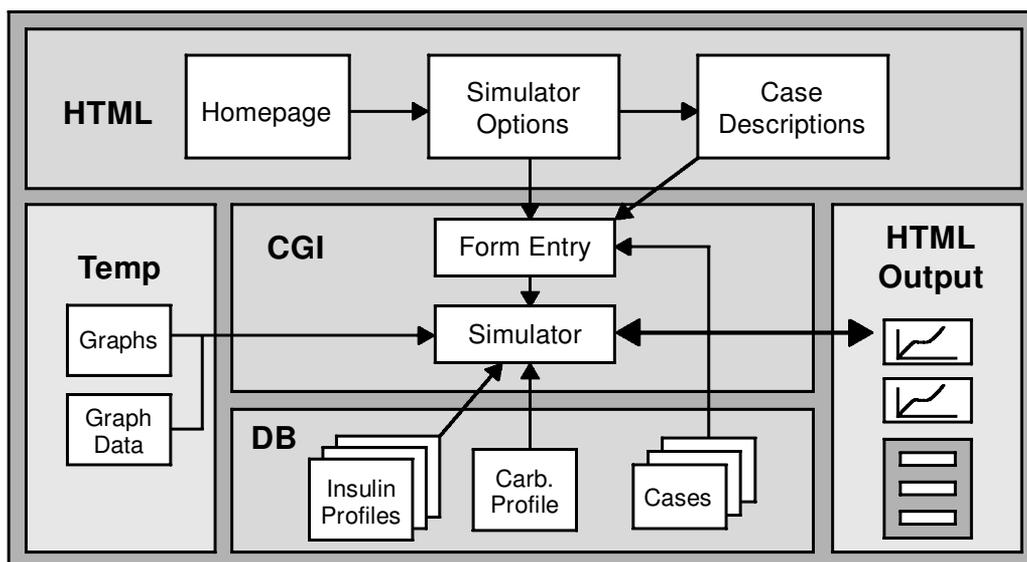


FIG. 1. Basic structure of AIDA online (derived from Lehmann²⁸). HTML, HyperText Markup Language. The AIDA online HTML homepage (www.2aida.org/online) presents the user with various simulator options and case scenarios. A series of dedicated (Common Gateway Interface) CGI-BIN scripts written in Perl v5.0 are used to read case scenario data and insulin and carbohydrate profiles from the database (DB). The plasma insulin and blood glucose profiles are computed using a further Perl script, which contains the AIDA model differential equations (and which makes use of some temporary storage space on the AIDA online server). Output from the simulator is returned to the user in HTML format for display by a Web browser. Further details about how AIDA online works can be found elsewhere in this journal.²⁷

1996—it is interesting to see how quickly such a simulation program can be adopted for wider research application. This should encourage more researchers to consider making use of the Internet for the distribution of their work. As in the case of AIDA, such distribution may not only possibly be of use to patients directly, but may also actually help to promote further research. In addition, publication of all AIDA model and systems details—as can be found both in the literature^{5,29} and on the Internet—may help to support further research work in this field (see below). However, it is very possible that the ventures reported in this review under-represent the totality of research projects that have actually been making use of the AIDA software. This may be because since the information was first made live on the Internet—at www.2aida.org/aida/research2.htm—it has been openly and freely available. As a result fewer students and researchers have actually needed to get in contact prior to embarking on their own research projects using AIDA.

GENERATING SIMULATED BLOOD GLUCOSE DATA—FOR TRAINING/VALIDATION

The computer-science literature is full of descriptions of decision-support prototypes that attempt to provide therapeutic advice for patients with diabetes. Such prototypes use a wide variety of different computational techniques (see previous publications^{12–15,30} for an overview). While academically and intellectually such approaches may be of interest in their own right, often the prototypes stumble at the first real medical hurdle—that of testing or validation. Computer scientists with access to computer labs and computer facilities may have limited access to patients with diabetes. Therefore achieving clinical collaboration to take forward the verification, validation, and clinical evaluation of such prototypes is not without its difficulties.

AIDA cannot offer a complete solution to this problem. However, it does offer a way for computer scientists and medical informaticians to

generate some reasonably realistic blood glucose data—from a wide variety of “virtual diabetic patients.” Such data can then be used for testing other computer-based prototypes. In this respect testing of a decision-support prototype against data from AIDA’s 40 example case scenarios should at least help to identify areas where further refinements or work are required. Also, while such simulator-based testing cannot replace clinical testing with real patient data, it may be that positive simulator-based test results may help to encourage clinical collaboration to take forward the validation testing with real patient data.

In support of this—as for patient, relative, carer, or health-care professional use—AIDA is freely available via the Web (from www.2aida.org/download). If researchers require access to a large quantity of blood glucose data, for example, to train an artificial neural network, they may find the AIDA online diabetes simulator of more use than the PC version.

AIDA online—accessible directly at www.2aida.org/online—has a feature that allows the

raw simulated blood glucose data to be outputted in electronic form. To make use of this facility, researchers simply need to run a simulation and then click on the underlined HTML Data link in the top right corner above the blood glucose graph (Fig. 2). This will provide access to the “raw” simulation data at 15-min intervals.

How researchers make use of these data is up to them. However, they could select certain data points from this (e.g., before meals) and feed these through their prototype and also provide them to some clinicians for an assessment of the advice from their computer program. Alternatively, they could make use of all the data passing it to a neural network—to provide some preliminary training for that network.¹ As highlighted above, it should be stressed that such data cannot replace similar testing/training with real patient data. However, it is hoped that the ready availability of simulated blood glucose data may save a considerable amount of time—especially during the early stages of a new prototype’s development.

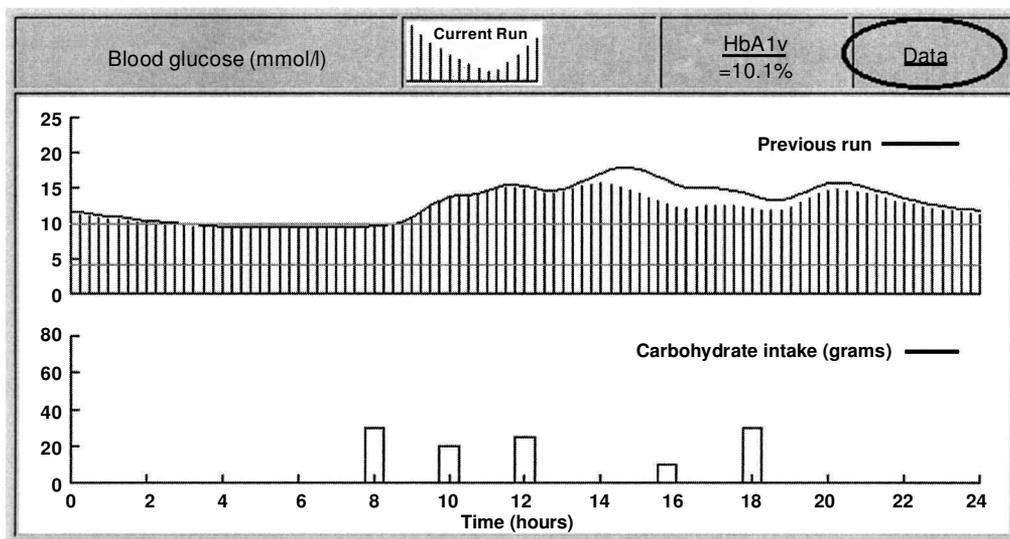


FIG. 2. Example simulation from AIDA online at www.2aida.org/online on the Web (derived from Lehmann²⁸). The graphs show a blood glucose simulation for a sample case scenario from the AIDA online database. Further cases can be created by users. Blood glucose level and carbohydrate intake over a 24-h period are shown. User-definable normoglycaemic ranges [4–10 mmol/L (72–180 mg/dL)] are superimposed. Plasma insulin level and insulin injections for this case are not shown. The haemoglobin A1c (HbA1c) value gives an indication—for educational purposes—of the glycosylated haemoglobin level predicted by the AIDA model, if the current glycaemic control were to be maintained in the medium to long term. The data link (circled) in the top right corner provides access to the raw data—which make up the AIDA online graphs—in an electronic form suitable for importing into other software analysis or graphing programs.

EVALUATION/VALIDATION RESEARCH USAGE OF AIDA

AIDA, being widely available and completely free, could also serve as a useful “test bed” for generally establishing how best to evaluate educational medical software programs. Although many prototype medical applications have been described, the majority do not seem to be used so extensively, so such evaluation issues have not been considered in great detail, especially in diabetes care. In this respect, to date, AIDA has generated some useful discussion about the best research methods to apply to properly validate and evaluate such programs,^{31,32} and it is expected that AIDA will stimulate further contributions to this debate in the future. Connected with this, because AIDA is so widely used it should be possible to start to address such evaluation issues in greater detail and potentially with a larger number of evaluators. Some of these evaluation issues have been considered in detail previously elsewhere in the literature^{9–11,33–35} as well as in this journal.^{31,32,36,37}

OTHER RESEARCH USES OF AIDA/PLACING TECHNICAL INFORMATION ON THE WEB

Placing the AIDA Technical Guide on the Web (now available at www.2aida.org/technical) has also yielded interesting and surprising results. This technical overview of the AIDA model, and how the simulator works, was first uploaded to the Internet in July 1998. In the 4 years from then until July 2002, the Web page has received over 7,000 visits. This illustrates how putting such material on the Internet allows a lot more people access to such technical/research information than would have been the case just through standard paper journals.

In addition, since AIDA moved to its own dedicated Website in October 2000 various more recent research articles have been made available on the Internet in electronic form. These research papers can be accessed completely free-of-charge as portable document format (PDF) files. In the approximately 1.75

years from October 2000 to July 2002 there have been over 8,500 “hits” recorded on these PDF files at the AIDA Website. Even leaving out leaflets, questionnaires, and consent forms, which are also available as PDF files, there have still been over 6,200 “hits” on research articles at the site. We have recently highlighted elsewhere in this journal some of the issues surrounding reliance on “hits” as a measure of Website usage.³⁸ Furthermore, viewing a PDF file in some Web browsers can apparently lead to multiple hits being recorded—depending on how the browser handles the PDF file. Nevertheless, there are few researchers who could have serviced anything approaching this sort of level of interest/reprint requests, manually, via post/air mail in previous years.

It is expected that such articles (and the on-line AIDA Technical Guide) are two of the ways that information about AIDA has been disseminated so widely. Once again, this illustrates how placing such material on the Web allows much larger numbers of people access to such research information than would have been the case just through regular libraries and standard hard copy reprint requests.

CONCLUSION

The conclusion from all this experience is that more researchers should consider making use of the Web to disseminate their programs and work. Not only can such Web-based distribution help patients and their relatives—in the case of AIDA through education—but it can also help promote and support further on-going research by others. In this respect, clearly AIDA has seen use—not only by patients, their relatives, students, and health-carers—but also as a tool for research application in other diabetes-computing domains.

We hope this overview of such research projects may be of wider interest and use. In this respect a supplementary purpose of this review, and the material at the AIDA Website—at www.2aida.org/aida/research2.htm—has been to show what has been tried to date and perhaps maybe help to reduce duplication of effort and “reinventing of the wheel”

in this field. Related to this, perhaps future researchers will be encouraged to try some slightly different approaches as a result of knowing about this earlier work. This is especially the case as much of the research work reviewed in this article has only been published in abstract, thesis, or conference proceedings form—and therefore may not have been so widely disseminated or known about.

HAVE A RESEARCH PROJECT OF YOUR OWN?

We maintain the “Research Use” section at the AIDA Website—directly accessible at www.2aida.org/research—as a way of highlighting one of the benefits of distributing work, like AIDA, via the Internet. Also we hope that more students/researchers embarking on their own diabetes-computing research projects may consider whether AIDA could be of use to them. If you are thinking of undertaking a research project—and are wondering whether AIDA might be able to help—please feel free to contact the AIDA authors at www@2aida.org. We are happy to support such research use of the software—in whatever small ways we can—even from afar. If you have already made use of AIDA for research purposes—please do get in touch. We are always interested to hear about a wider range of peoples’ experience with the software.

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