Introduction

Diagnostic Reasoning is a complete computer patient simulation package consisting of prepared patient cases, management tools (for setting the evaluation criteria, analyzing student records, and enriching the program with learning resources and content questions), and authoring tools (for developing new cases of your own).

DxR was developed because healthcare professionals face the difficult task of determining the clinical reasoning skills of individual students. The current procedure of observing and mentoring students during preclinical patient encounters and clinical clerkships provides considerable insights into the clinical reasoning process, but does not provide any means of quantifying the specific skills.

Diagnostic Reasoning software, on the other hand, does have the ability to monitor each action of the student during the "patient" encounter and to provide feedback about the level of clinical reasoning he or she has demonstrated.

This manual provides detailed instructions for how to use the management tools. The instructions explain how to set the evaluation criteria for any Diagnostic Reasoning Case. There are also instructions for how to collect individual student data into the Record Utility, which can not only analyze an individual student’s record but also provide summary performance data for a group of students who completed the same Case.

Because each clinical problem brings with it a set of learning issues that may stimulate a student’s need to know basic content, we have designed the software so that users can access web sites containing learning resources, such as basic knowledge and clinically relevant content. This feature permits the student to access a learning resource from within the patient case and review the relevant learning issue in the context of the problem-solving task. And finally, another important feature of the DxR software is the Query Utility, which allows you to attach content-related questions to a given case. This feature lets you test the student’s content knowledge, again in the context of the problem-solving task.

The intent of the software is to give you, the instructor, control over the contents of the Case and the way in which the evaluation criteria are set so that you can provide the best educational experience for your students.

J. Hurley Myers, Ph. D.
Professor of Physiology and Internal Medicine
Southern Illinois University School of Medicine
President, DxR Development Group, Inc.
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Getting Started

Diagnostic Reasoning (DxR) consists of a powerful set of tools designed to make the classroom experience a valuable and pleasant one for both faculty and students.

The Diagnostic Reasoning package includes three basic components.

The DxR Management tools enable you to control who gains access to a DxR case or cases and what the users see when they enter a DxR case. You can grant or restrict access, edit patient data, edit evaluation criteria, or choose to maintain the same data and/or evaluation criteria that the case author created. The criteria set by the instructor and/or case author form the basis for evaluating student performance in investigating the case and reaching a diagnosis. DxR Management also includes tools for maintaining files for students who are assigned to work through a DxR case.

The DxR Cases consist of data collected by our case authors based on real patient encounters. Rather than conducting an in-person investigation, students will open a DxR case and will begin a simulated clinical investigation using the tools available in the DxR case. Students will have access to the same basic clinical investigative techniques that are available to a healthcare professional dealing with an actual patient. Using the DxR case information, students will be able to submit questions to the patient, conduct a simulated physical exam, and order lab tests. The student will also be able to see and review the results or responses before making a diagnosis and ordering treatment. At the end of the case, the student will be able to access an initial assessment of his or her performance compared to the instructor’s expected responses.

The DxR Record Utility — the only component of the DxR package which isn’t web-based — is where the instructor can review and evaluate student and group performance on a DxR case. The Record Utility also allows instructors to change the evaluation criteria set earlier in DxR Management or override the computer’s evaluation. The Record Utility is also the only place that instructors can evaluate the student’s management plan. Data from the Record Utility can be printed for student or faculty use.

Diagnostic Reasoning is a web-based application that can be hosted either on a web site at your institution or by DxR Development Group. If your institution is hosting the web site, the first step in using the Diagnostic Reasoning tool is to make sure your webmaster and/or technical support personnel know how you intend to use it (i.e. coursework, exams) and are aware of any special technical needs you may have. Technical requirements are listed in the Appendix of this manual.

We recommend that you start using Diagnostic Reasoning (DxR) by working through a patient case just as you would ask students to do. This will help you become familiar with the structure and presentation of DxR cases.
Prepare to Work through a Dxr Case Yourself
Your webmaster or technical support person will set up your cases and units. Contact your technical support staff to tell them what cases to install, and what to name your unit. Then you may use DxRManag to make a “student” login for yourself on one of the cases.

As you move through a selected case, be careful to note any changes in case data that you want to make. Most text data are editable. You should also take careful note of the Initial Assessment that appears at the end of a Dxr case (accessed using the Evaluate button). The Initial Assessment provides a first look at how student performance is assessed. It may provide you with the first indications of how you would like to change evaluation criteria before administering a Dxr case to your students. Keep in mind the educational level of your students and any specific teaching objectives as you complete the Dxr case. Such factors may affect your decisions on whether to edit case data and/or evaluation criteria.

To start working through a case, you must select a case or cases from the catalog and ask your webmaster to install the case(s) for your use. If your site is hosted by Dxr Development, call technical support and instruct the support personnel about the case or cases you would like to use initially. Since access to Dxr cases is restricted, you will first go to Dxr Management to allow yourself access. You should be provided a User ID and password to access Dxr management by either your webmaster or by Dxr Technical Support, depending on where your site is hosted. If your school hosts the web site, make sure you also receive instructions on where to access the Dxr case or cases that you requested. After you have allowed yourself access to a Dxr case you will be ready to work through the case just as a student would. Follow the steps in the Quick Help that appears on pages 12 and 13 of this manual. After your case review, you will know whether or not you would like to edit patient data and/or evaluation criteria. If you choose not to edit any of the case content or the evaluation criteria, you can skip to the instructions for setting up cases and units.
Access DxR Management
If your site is hosted by the DxR Development Group, we will have given you a username and password to allow you to access DxR Management at the address listed below. Please note that this address is case sensitive.

http://yourschool.dxronline.com/DxR/DxRManag

If your school is hosting your site, your site's web master or system administrator will provide a user id and password, as well as the address of the site. The DxR Management tool is installed at a location that will look like the example below. Please note that this address is case sensitive.

http://your_site/DxR/DxRManag

The log-in window for DxR Management will ask for your User ID or User Name and Password. When you are successfully logged in, you will see the DxR Management Index screen.
Usernames and passwords
To allow yourself and/or your students access to a DxR case, you must first enter usernames and passwords.

Using care in how you enter the names and passwords will ease the process of logging on to a case. Usernames and passwords are case and space sensitive. Each time a user (either you or a student) accesses a case, he/she must type in the user name/password identically to your chosen format for entering the user name and password list. Users who deviate by including extra spaces or by changing letter case won’t be able to access the patient case, so it’s important that you make students aware of the exact format for their usernames and passwords.

Step 1. Creating an access list for users
When giving a group of students access to a case or group of cases, we recommend that you create your lists of usernames and passwords using a plain text editor such as Word Pad or SimpleText following the format specified below, and then save the file as plain text. In a word processor such as Microsoft Word or Appleworks, enable the Show Invisibles feature so you can see the spaces you are typing.

If you choose to enter your list directly into the Name/Password field on the UserNames and Password screen, read Step 2 for formatting instructions. (You may choose to enter names directly if you are adding access for a single user, but please note this is not the recommended procedure for entering a list of student names.)
Step 2. Formatting Usernames & Passwords

The format for entering usernames and passwords is as follows:

Jennifer Johnson/the password of your choice

- Any letter, uppercase or lowercase, or number may be used. Dashes such as in an ID number are permitted, but slashes may only be used to separate the user's name from his/her password. A forward slash (/) must separate the username from the password in your list.
- Hit Enter (Return) after each username/password combination since each combination must be on its own line.
- Names should use only regular letters and/or numbers. A space between first and last name is OK.
- Names must be unique.
- Passwords can contain letters, numbers and dashes, or any other typed character except a slash.
- Passwords do not need to be unique, though this is preferable.
- A password can be the student's Social Security number, complete with dashes. Out of concern for the user's privacy, however, some instructors may choose to use only the last four digits of the student's Social Security number.
Step 3. Enter your usernames/passwords

Navigate to the Index screen of DxR Management and click UserNames and Passwords to go to the User Password screen. You have three options for how to allow users access to a case or a group of cases.

- If you want to enter a list of names for a single case, go to your text editor, copy the list you've created, and paste it into the Name/Password Entries field. Select an individual case from the field labeled “Case From List.”
- If you want to enter name(s) directly, place your cursor in the field labeled Name/Password Entries and type in the username and password, formatted as directed above. Select a case from the field labeled “Case From List.”
- Path to Directory... You may ask your webmaster to create units of up to 12 cases each. If so, each unit will have a title. If you want to allow all users in a list access to an entire unit (a group of up to 12 cases), you will enter a path that will lead to the unit in the field labeled “Path to Directory of Cases.” The path is made up of two periods, forward slash, DxR (mixed upper and lower case), forward slash, followed by the unit name and another forward slash.

For example: If you want to allow the same group of users access to all the cases in a unit called Block_1A, you would enter the path as follows.

```
../DxR/Block_1A/
```

Click Make Password Files. The next screen will advise you if there has been an error and will also display a file path. Click Return to Index.

Step 4. Optional: Restricting User Access to a Case or Unit

You may, for a variety of reasons, wish to restrict access to a case or unit. If you set up a Unit but want students to access the cases one at a time, enter the username/password list case by case as needed. If a case is to be completed by a certain date, changing the users' passwords to one they don't know and are unlikely to guess will prevent them from continuing to work on the case after the due date. This technique of changing a password to one unknown to the user will work for any instance where you need to prevent further access to a case or unit by any user or users. Again, we recommend making any username/password changes in your text document first, then copying the revised list into Name/Password Entries and re-Make Password Files for the case or unit in question. This will maintain consistency between your offline list and online list. User access is restricted in the default settings with which the software is shipped, so a list of usernames and passwords must be entered to gain access to a DxR case.

Step 5. Optional: Confirming or Recovering Usernames and Passwords

At some point, you may wish to confirm or retrieve the username/password list you entered in DxR Management. This is helpful if you have added individuals to your original list or if your original text file has become corrupted.

Select a case from the case list field and then click Show Users (bottom-right corner of the UserName and Password screen). A list of Usernames/passwords will appear, formatted as shown below.

```
Jennifer Johnson/password (in whatever form you chose in Steps 1-4)
```

After you have finished entering usernames and passwords, authorized users may enter a DxR case.
1. STARTING
   a. Follow the URL or Link provided by your instructor to the desired case. You will access the patient case either directly by clicking the Diagnostic Reasoning opening screen, or through a waiting room.
   b. Enter your assigned name and password. After name/password are verified, click Start.
   c. Review the information on the patient’s Presenting Situation. Answer the question “What would you like to do next?” Click Interview, Physical Exam or Lab to begin your investigation.

2. INTERVIEW PATIENT
   a. Click INTERVIEW button. Initially you may be able to see only the Present Illness Category. Select any questions appropriate for that category as directed below (2c).
   b. Follow the on-screen instructions to enter a Diagnostic Hypothesis and access other categories.
      1. After you enter your Diagnostic Hypothesis, you may need to select the hypothesis you are investigating from your list at the top of the screen before you can ask a question. If you aren’t investigating a particular hypothesis, select Scanning.
      2. To associate a question with more than one Hypothesis, hold down the CTRL (Command) key while clicking the appropriate hypotheses.
      3. To associate multiple questions with the same hypothesis, hold down ALT (Option) while highlighting the questions.
   c. Click the category for the question you want to ask. Questions are listed in the box in the upper half of your screen. Highlight the question and click Ask. The response appears in the box below.
   d. To find a question among the various click Search at the end of the category list and enter a keyword or phrase in the box that appears.

3. STATEMENT OF PROBLEM AND DIFFERENTIAL DIAGNOSIS
   a. At some point in your investigation of the patient case, you will be asked to frame the patient’s problem and list the possible causes (diagnostic hypotheses) of the patient’s problem. List causes in the order of importance. When you have completed your initial list, click DONE to return to the patient. If you would like to gather more data from the patient before entering this information, close the DDx window. Depending on your instructor’s preferences, you may not be able to investigate areas other than the Present Illness without entering your hypotheses.
   b. If you would like to change or rearrange your list of diagnostic hypotheses, click the DIFFERENTIAL DIAGNOSIS (DDx) button.
      1. To edit your statement of the patient’s main problem, type changes in the text field at the top of the dialog box.
      2. To add a diagnostic hypothesis, type it in the middle text box, then click ADD.
      3. To delete a diagnostic hypothesis, select it and click DELETE.
      4. To change the order of the diagnostic hypotheses, select the one you want to move and click UP or DOWN. It will move one position in the list.
      5. When finished, click DONE.

4. PERFORM A PHYSICAL EXAM
   a. Click EXAM button. If you are prompted with the Hypothesis Screen, make any changes you wish and click Done when you are satisfied with your entries.
   b. Specify the diagnostic hypothesis you are investigating.
   c. Select the appropriate tool, then click the body part you want to examine.
   d. Click the button for the Body View you wish to examine (i.e., head, chest, abdomen). Click Other Exams to access Observations, Maneuvers, or Mental Status exams. Click Vital Signs to see a list of the patient’s vital signs. The name of the tool and the body part that your cursor is positioned to select will be displayed above the patient picture.
   e. Some exams will yield audio, graphic, or text data that you must interpret before you can enter a diagnosis. (Heart sounds are soft, you may need to use head phones to hear them clearly. QuickTime is required to play sounds.) Enter your interpretation in the text field provided, then click Enter. Click the CONSULTANT button to view any available professional consultant information.

5. ORDER LABORATORY TESTS
   a. Click LAB button. If you are prompted with the Hypothesis screen, edit as you wish and click Done.
   b. To order a test from group of 32 common tests, specify the diagnostic hypothesis you are investigating, then click the desired test. The patient’s results will be displayed. Click NORMAL button to compare patient results with normal values for the specified test.
   To get additional information about a common lab test before ordering, click the TEST INFO button, then select the test for which more information is desired. Before ordering a test from the lab info window specify the diagnostic hypothesis you are investigating. Select ORDER to request the patient’s lab results.
   c. To order tests not listed in the common group, select a category of tests, then select the test from the list of available tests for that category. Specify the diagnostic hypothesis you are investigating by clicking the correct diagnostic hypothesis. Click ORDER. To get information about one of these tests prior to ordering it, highlight the test, then click the TEST INFO button.
   d. To search the database of lab tests for a specific test, enter the test name or related keyword, and click the Search button.
   e. View and interpret all available consultant information as described above (4f).
6. ENTER DIAGNOSIS

Click **DIAGNOSIS** button to enter your final diagnosis. Click the diagnostic hypothesis that most closely matches your final diagnosis and click **SELECT**. In the next text field, edit this hypothesis to express your final diagnosis in pathophysiologic terms. Justify your diagnosis and select your confidence level. When you are satisfied, click **ENTER FINAL DIAGNOSIS**. (Click **CONTINUE**.)

7. MANAGEMENT

Select the aspects of management you wish to prescribe by clicking the specific buttons and detailing the treatment you desire. When finished, click **EVALUATE** to have your performance evaluated. Answer Management Confidence questions 2, 3, and 4. Click **Done**.

8. INITIAL SELF-ASSESSMENT

The initial self-assessment provides information about your investigation of the case. Click one of the categories at the top. A star next to the category indicates you completed the task successfully. On each screen, items you requested during your workup of the patient are marked with a star. Click an item to review the patient results.

**NOTES** You may use two methods to record text to your personal **NOTES**.

a. To record data while interviewing a patient, conducting a physical exam or ordering lab tests, highlight the text to be saved, then click the **ADD** portion of the **NOTES** button. (Some browsers do not support this feature. In this case you will need to select the text you want, copy it to the computer’s clipboard, open the Notes window, and paste in the text.)

b. To review, edit or delete existing notes, and/or add new information to your notes manually, click the **VIEW** portion of the **NOTES** button.

c. You must click the Save button in the Notes screen to preserve your changes.

d. To print your notes copy them to a word processor or use your browser’s print function.

**LEARNING ISSUES** and **SOAP NOTES** If you wish to make note of learning issues encountered within the program, click the appropriate button. You must click the Save button to preserve your changes.

**EFFICIENCY WARNING**: You will see a warning when you are within 3 of the total number of questions, exams or lab tests deemed necessary to complete this case efficiently. You will be warned again when you are within 1 of that number. You may continue collecting patient data after the warning, but if you do, you will not be able to reach the highest level of performance.

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**HINT:** To measure temperature sensation on various parts of the body, such as the foot, ankle, hand, etc., use the tuning fork. This measures response to a cold tuning fork.
Editing Case Data – Changing Evaluation Criteria

After going through a case, you may decide to change the evaluation criteria or perhaps replace patient responses within the case. Diagnostic Reasoning cases allow you, the instructor, to modify the cases to better fit your teaching needs. The Edit Case Data link on the Dxr Management screen allows you to customize Dxr patient cases by editing patient data, altering student evaluation criteria, selecting case delivery options, and questioning students on-line as they complete the Dxr case.

To begin editing case data, click Edit Case Data on the Dxr Management Index screen. Select the name of a case from those listed and click Enter. Now choose the type of information you would like to edit. The Patient Intro, Interview, Exam, Lab and Management buttons allow you to edit patient information within the case. The Evaluate button allows you to edit the criteria used to evaluate student performance. The Case Delivery, Query, and Query Management buttons allow you to manipulate how the case content is delivered to the student.

Editing Patient Data

What types of patient information can you change? Almost all text data within the cases can be edited. Each time you select a question, lab, or exam, you will have the opportunity to change the text response or result. You can also add links to learning resources to provide your students with more information while they’re working through a Dxr case. If you have additional graphics or movies, please contact Dxr technical support for information on how to proceed.

Patient Intro Button

This function allows you to change the Presenting Data that’s displayed when the students first enter the case. We recommend you do not change the patient name since any changes wouldn’t be reflected on graphics of the patient.

Click Save Changes when you are done editing this information.

NOTE

Case data exists on the webserver. Changes you make to Case data will overwrite existing data on the webserver, so it may be helpful to maintain a record of your changes in a separate text file.
**Interview Button**

In this section, you may change the patient's responses to questions. You may also require students to justify certain questions or requests for information or to interpret the patient's response. You may provide students with an expert opinion in the form of Consult Text after they make the interpretation.

Select a category, and when the list of questions appears, select a question. Click the Ask button to see the existing response. Click the Edit button which appears after you have clicked Ask to alter the patient's response.

---

**Case: DxR/Patients/Dombkoski**

**Medical History**

- Allergies [Medical History]
- Asthma
- Personal or family medical history
- Birth history - prenatal, perinatal, postnatal
- Blood transfusions
- Drugs, present medication, past medication, non-medical use
- Family medical history
- Growth and development history
- Gynecologic history
- Healthcare professionals currently involved with the patient
- Immunizations
- Injuries
- Past medical history including psychiatric, surgical, previous lab

**Family medical history**

'My father died at age 72 of a heart attack. My mother died of old age at 86, and had arthritis. My two brothers are overweight and have some breathing problems, but not as bad as mine. My sister is fine. No one ever died young. No other serious breathing problems.'

**HELPFUL HINT**

There must be a single space between the close quotation of the hypertext reference and the word target in the address to your link.

---

**LEARNING RESOURCES**

You can link electronic learning resources (such as links to websites, etc.) to any section of a Dxr case. Students will be able to click the link to access these learning resources directly from within the program.

For example, if the patient is experiencing shortness of breath, you could type in an HTML link for a website that provides the student more information on that problem.

HTML links can be typed in any editable text field. However, any links typed in the Consult text field will be displayed to the student only after he/she enters an interpretation of the item.

A typical link should be formatted like this:

```html
<a href="http://your.link.com" target="_new">click here for learning resource</a>
```
If you choose to require a student to interpret an interview item, type a question prompting the student to interpret the information into the Text field, immediately following the patient response. (Be careful not to delete the patient response.)

Example: “How do you interpret this response”

If the field labeled Interpret Name is empty, you must enter a title for the interpretation you are requesting. This should be a name/title describing the specific item you are asking the student to interpret. The students will see this name after they order the item and view the response.

Example: For a question about the patient’s family medical history, the Interpret Name could be “Family History.”

If you choose not to request students to interpret a response, leave the Interpret Name field blank and do not type in a question following the patient’s response.

Check the box marked Justify to require students to justify their requests for this information. If the “justify request” box is already checked, click on the check if you want to remove the prompt to justify the selected item.
**Justify Interview/Exam:** You may ask students to justify interview, exam or lab items, or you may remove a request to justify that is already included for those items. You may choose to ask students to justify an exam or an interview item to gain insight into a student’s clinical reasoning. If so, check the Justify box. The case author may have included a request to justify certain items. If you disagree with this request, click on the checkmark in the Justify box to remove the request.

Optional: Type the text of an expert opinion in the field marked Consult. A student will be allowed to access the information from this text field only after he/she enters an interpretation of the interview item associated with the text.

Click **Save Changes** to write your modifications into the patient database. If you want to see your changes immediately, select the item as a student would and click Ask.

**Exam Button**
In the exam section, you may change the patient’s physical exam results, as well as ask the students to justify their requests for information. You may also require the students to interpret the patient’s exam results, and provide them with an expert opinion in the form of Consult Text.

To edit exams, click the body view (using the small patient icons) that shows the body part you want to examine, then click the exam tool you want to use. Select the Body Part from the list that appears.

When the exam results appear, click Edit to retrieve the results in an editable form. Make desired changes and click **Save Changes**.
Note: If you edit results for an exam that would also be listed under Vital Signs, you must also edit the same values under Vital Signs.

Click Other Exams, select an item from the list, then click Edit to change the results for observations, maneuvers, or mental status exams. Also under Other Exams, select Vital Signs from the list to edit the patient’s vital signs. Click the Edit button to change the results for these values. Please note that making changes under Vital Signs will not change patient data for other exam tools displaying the same information. Edit them separately.

If you choose to require students to interpret an exam item, type a question prompting the student to interpret the information into the text field, immediately following the patient’s exam information.

Example: “What is your interpretation for this sound?”

If the field labeled Interpret Name is empty, you must enter a title for this interpretation. This should be a name/title describing the specific item you are asking the student to interpret. The students will see this name after they order the item and view the response.

Example: For the interpretation of the patient’s pulmonic heart sound, the Interpret Name could be “Stethoscope|Heart Pulmonic.”

If you choose not to request students to interpret a response, leave the Interpret Name field blank and do not type in a question following the patient’s response.

Check the box marked Justify to require students to justify their requests for this information. If the “justify request” box is already checked, click on the check if you want to remove the prompt to justify the selected item (see Justify Interview/Exam on the previous page.)

Optional: Type the text of an expert opinion in the field marked Consult. A student will be allowed to view the information from this text field only after he/she enters an interpretation of the exam item associated with the text.

Click Save Changes on each screen where you make changes.

**Lab Button**
Here you may change the patient’s lab results.

Select a category, and when the list of labs appears, select the lab you want to view/edit. Click Test Info to see a description of the test, the normal value/reading for the lab test, what “abnormal” indicates, and the relative cost.

Click Edit to change any of the text information about this lab test, including the definition.

In the field labeled Text, you will be able to change the lab result. You may also ask the student to justify his/her request for information, change or add consultant information, edit normal values, edit the lab definition, and alter the lab cost.

The definition field is the only place where you can edit the Test Description and what Abnormal Indicates for a particular lab test. Click Test Info and then Edit for your chosen lab test. The text that appears in the Definition field may have one or more “|” symbols following the description of the lab. Highlight and edit the information after
the first "|" symbol to change what the a lab result of Abnormal Indicates. Please do not remove the "|" symbols. If you want to change Lab Costs or Normal Values, highlight and edit those entries in the corresponding text field.

- If you choose to require students to interpret an exam item, type a question prompting the student to interpret the information into the text field, immediately following the patient's exam information.

Example: “What is your interpretation for this result?”

If the field labeled Interpret Name is empty, you must enter a title for this interpretation. This should be a name/title describing the specific item you are asking the student to interpret. The students will see this name after they order the item and view the response.

Example: For the interpretation of the patient's chest x-ray, the Interpret Name could be “Chest (X-ray)(CXR).”

If you choose not to request students to interpret a response, leave the Interpret Name field blank and do not type in a question following the patient’s response.

Check the box marked Justify to require students to justify their request for this information. If the “justify request” box is already checked, click on the check if you want to remove the prompt to justify the selected item (see Justify note.)

Optional: Type the text of an expert opinion in the field marked Consult. A student will be allowed to view the information from this text field only after he/she enters an interpretation of the lab item associated with the text.

Click Save Changes after you’ve made all the desired changes.
Justify note. Most requests to justify a particular item will occur in the lab category, often to prompt the students to assess the cost of a lab versus the benefit or necessity of ordering it. Because of the huge number of lab tests in the database, results have been entered only for the lab tests that students are most likely to select. The results for Lab tests for which no values have been entered will show up as Normal/Negative. As a default, students are asked to Justify all labs that have a normal/negative result. If you don’t remove the Justify request from some labs that have normal/negative responses, students may learn that a request to justify always precedes a normal/negative result and simply stop short of ordering labs that they are asked to justify. If you want to remove the requirement for students to justify such labs, click the checkmark in the Justify box.

Management Button
The Management Section contains no responses/results to edit, but does allow you to enter questions that will appear when the student makes certain selections.

Select the category from the list on the left. A list of available management options will appear. Highlight the option that you are interested in and click Edit. You will now see a list of Question Options.

If you select No Question, the student will not be prompted with any question when selecting this item. If you leave the Default Question marked, then the question “What would be the purpose of this?” will appear if the student chooses this item. The cases are preset with the Default Question selected unless the Case Author has entered a Custom Question in its place. You may select Custom Question to enter your own question. If you made changes, click Save.

After you are satisfied with your changes to patient information in a DxR case, you may select another type of information to edit or return to the DxR Management Index screen.

Evaluate Button: Editing Evaluation Criteria
Before you edit the criteria for evaluating student performance, it’s best to understand what is being assessed at each evaluation point, how it’s being assessed, and how your changes may affect student scores. The pages that follow first deal with how student performance is evaluated and then with editing the criteria that provide the basis for the evaluation.
Diagnostic Reasoning provides two forms of evaluation: a numerical Clinical Reasoning Score (100 points maximum) and a qualitative Level of Diagnostic Performance (one of 10 descriptors ranging from Inadequate to Impressive). Each score is arrived at independently.

For the Clinical Reasoning Score (CRS), students will receive points for certain achievements in the clinical investigation, including considering the correct diagnosis as part of their listed diagnostic hypotheses, arriving at the correct diagnosis, and selecting the investigative items from the patient information needed to confirm the correct diagnosis and rule out competing hypotheses.

The Level of Diagnostic Performance is a descriptive, qualitative measure based on the items the student selects in his/her investigative inquiry. The Diagnostic Performance evaluation is governed by a paradigm which eventually classifies a student’s performance by one of ten descriptions.

Note: The student’s patient management selections are scored numerically based on scores in four sub-categories under patient management. You may assign a numeric value to the sub-categories of Required, Recommended, Related H & P, and Related Lab, based on the relative importance of each category later in the Record Utility.

**How Criteria Work in the Evaluation Paradigm**

The Evaluation Paradigm represents a decision tree used to evaluate student performance. The evaluation of student performance begins at the diagnosis (Expected Outcome).

To arrive at a Level of Diagnostic Performance students will move through a yes/no decision tree. In each branch of the tree, a student will move up only if he/she selected all the items designated as criteria for success at that node. The student will move “down” if he/she failed to enter/select all items designated as criteria for success at that node.

**DEFINITION: NODE**

A node represents a point of assessment for an area or level of diagnostic proficiency.

**DEFINITION: CRITERIA ITEMS**

Criteria items are responses that the case author and/or instructor designate as key items in evaluating the student’s performance on the DxR case. Criteria are patient items the student must list to receive full credit for that node of the evaluation paradigm.
Depending on their entries at the Expected Outcome (correct diagnosis) node, students move either “up” the paradigm toward the highest performance level (IMPRESSIVE), or “down” the paradigm toward the lowest performance level (INADEQUATE).

The criteria for each node are set initially by the case author, but can be changed using DxRManagement.

The Clinical Reasoning evaluation is derived from points assessed for achievements at five different nodes. They include listing the correct diagnosis among their hypotheses, arriving at the correct diagnosis, justifying the diagnosis, ruling in and out competing hypotheses, and doing a thorough work up. The case author and/or instructor select the items the student must include at each node to receive full credit. At each of the first two nodes (Expected Outcome and Diagnosis Considered), the student will receive either all the possible points for that node or none of the possible points. At the Justify, Competing, and Thorough nodes, students who include some but not all criteria items will receive partial credit for including some of the criteria items. This scoring method allows the possibility of a reasonable score for students who reach the incorrect diagnosis, but are otherwise thorough.

In describing each node, we've outlined how the student's Level of Diagnostic Performance and the Clinical Reasoning score would be affected.

**Expected Outcome Node (Diagnosis)**

*At this node, the question is “Did the student include all the required Parts of the correct diagnosis?”*

Within the DxR program, students enter their expected outcomes (diagnoses) as free text. The software searches the text of the students' entries for key words and phrases that match the case author's/instructor's responses. Since some diagnoses are complex or multi-faceted, the software allows the case author or instructor to enter up to five sets of synonyms (key words or phrases) to define the expected outcome (diagnosis). All are considered "Parts" of the expected outcome, but some Parts may be considered more significant than others in describing the diagnosis. One of the Parts of the correct diagnosis must be Required for success at the Expected Outcome node. A student must include all required Parts to move up the evaluation paradigm. (Parts which aren't marked as required are evaluated in the Thorough node.) Depending on the educational level of students, you may choose to require only certain parts at this point in the evaluation process.

**For the Level of Diagnostic Performance:** To move up the paradigm, a student must include at least one synonym from all required Parts of the correct diagnosis. If so, the student will move up the evaluation paradigm to the Justified Diagnosis node.

If the student failed to list at least one synonym from each required Part of the correct diagnosis, he/she will move down the evaluation paradigm to the Diagnosis Considered node.

**For the Clinical Reasoning Score:** Students who enter all required Parts of the correct diagnosis from their hypothesis lists will receive the points
assigned for both expected outcome (default total points possible = 10) and for the Diagnosis Considered node (default total points possible = 40), since the student both considered and chose the correct Expected Outcome.

A student who fails to choose all required Parts of the correct diagnosis won’t receive any of the points assigned to the Expected Outcome node, but would move down the decision tree to the Diagnosis Considered node for examination of his/her hypothesis list.

**Dx Considered Node**

*At this node, the question is “Did the student list ALL required Parts of the Expected Outcome in his/her list of diagnostic hypotheses?”*

If a student failed to include all required Parts of the Expected Outcome (correct diagnosis), the next evaluation point will be at the Diagnosis Considered node. Here the student’s complete hypothesis list is examined to see if the student considered all required parts of the Expected Outcome in his/her hypothesis list.

**For the Level of Diagnostic Performance:** If the student included all required Parts of the Expected Outcome, he/she will next move to the Justify Diagnosis node.

If the student failed to do so, he/she will move down the decision tree to the Consider node.

**For the Clinical Reasoning Score:** Students who included ALL required Parts of the Expected Outcome in their hypothesis lists will receive all points assigned to the Considered node (default total points possible = 40). Students who omitted any of the required Parts of the Expected Outcome won’t receive any points for the Diagnosis Considered node.

<table>
<thead>
<tr>
<th>Student’s Diagnosis</th>
<th>Program’s Evaluation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>“The patient seems to have chronic obstructive pulmonary disease.”</td>
<td>Accepted</td>
<td>This diagnosis is accepted because it matches one of the equivalents entered by the case author or instructor.</td>
</tr>
<tr>
<td>“This patient has chronic asthmatic bronchitis leading to pulmonary hypertension, causing right atrial enlargement, and right ventricular hypertrophy.”</td>
<td>Rejected</td>
<td>Rejected because there is no reference to chronic asthmatic bronchitis in the equivalents entered by the case author or instructor. Chronic bronchitis is listed as an equivalent, however, chronic asthmatic bronchitis is not. Instructors can use the Record Utility to correct a student’s score to account for alternate wording.</td>
</tr>
<tr>
<td>“The patient has a emphysema.”</td>
<td>Rejected</td>
<td>The diagnosis is correct, but it is rejected because of a misspelling. Instructors may use the Record Utility to correct a student’s score to account for spelling errors.</td>
</tr>
</tbody>
</table>
**Needed to Consider Node**

*At this node, the question is “Were there sufficient clues to enable the student to consider the correct diagnosis?”*

If the student neither chose nor considered the correct diagnosis in his/her hypothesis list, the student’s record is examined at the Consider node for key elements that should have led the student to at least consider the Expected Outcome. Information used to answer this question comes from the student’s entries for history, physical, and lab which should clearly lead an investigator to consider the correct diagnosis as a diagnostic hypothesis. This list of clues should not be exhaustive. It should, however, contain the fundamental items that together point to the correct diagnosis.

**For the Level of Diagnostic Performance:** If the student didn’t select the items that would have provided sufficient clues to consider the Expected Outcome (Diagnosis), the student’s performance may result from an inability to frame the problem, usually associated with a cognitive knowledge deficit.

If the student did include items that would have provided sufficient clues to consider the expected outcome, the student’s failure consider the correct diagnosis could point to a misinterpretation of the available clues. Such misinterpretations may point to a cognitive knowledge deficit and/or a lack of competence with specific performance objectives, e.g. interpreting heart sounds.

If the student correctly interpreted the available clues but still didn’t consider the correct diagnosis, then his/her error probably results from ignorance of the disease process and/or a processing error (omission, inadequate synthesis, wrong synthesis). The student’s free text responses to key items may provide insight in pin-pointing the cause of the error.

There are no points assigned to this node for the Clinical Reasoning Score.

**Justify Node**

*At this node, the question is “Did the student include all questions, physical exams, and lab data necessary to justifiably arrive at the correct diagnosis?”*

The Justify node appears at two points on the evaluation paradigm. The questions, physical exams, and lab data listed as criteria at this node should represent the basic information necessary to justify the Expected Outcome. The data assessed here do not represent the ideal workup.

**For the Level of Diagnostic Performance:** If the student’s choices are sufficient to justify the correct diagnosis, but if the student failed to reach that diagnosis, his/her Level of Diagnostic Performance would be “Anchored.”

If the student choices aren’t sufficient to justify the correct diagnosis and if the student failed to arrive at the correct outcome, his/her Level of Diagnostic Performance would be “Premature.”

Students who reached the correct diagnosis but whose investigative choices didn’t justify those conclusions would see their Level of Diagnostic Performance described as “Lucky,” meaning he/she arrived at the Expected
Outcome by a lucky guess.

Students whose investigative choices provided a sound basis to justify their selection of the correct diagnosis move “up” the Evaluation Paradigm to the Competing node.

**For the Clinical Reasoning Score:** If the student chose some but not all of the criteria needed to justify a diagnosis, he/she will receive credit based on how many of the criteria items he/she included. For example, if the student included two of the four criteria items listed for the Justify node, he/she would get half the possible points for the Justify nodal (default total points possible = 20).

**Competing Node**  
*At this node, the question is “Did the student include all criteria items in ruling out competing hypotheses or attending to other critical issues?”*

The paradigm works best if the criteria set for this node evaluate a student’s choices in investigating the most important or most likely other hypotheses or diagnoses. Clearly, if students are expected to consider or rule out all possibilities in a complete differential diagnosis, virtually no student would successfully pass through this filter.

Example: In the case of a boy with knee arthritis, the Expected Outcome might have been juvenile rheumatoid arthritis. Other diagnoses for consideration might have been Lyme disease and rheumatic fever. Criteria entered at this point could reasonably include questions about exposure to insects, a question about the presence of a rash, an ASO titer, a Lyme titer, questions about fever and taking the boy’s temperature as part of the physical exam.

**For the Level of Diagnostic Performance:** If the student included all criteria items in ruling out competing hypotheses and/or attending to other issues, the student moves “up” the paradigm to the “Thorough” node.

If the student failed to include all the criteria items in ruling out competing hypotheses or dealing with other critical issues, the student will attain a rating of Premature for his/her Level of Diagnostic Performance.

**For the Clinical Reasoning Score:** If the student chose some but not all of the criteria needed to rule in or out competing diagnoses, he/she will receive credit based on how many of the criteria items he/she included. For example, if the student includes half the criteria items, he/she would receive half the points possible for the Competing node (default total possible = 15 points).

**Thorough Node**  
*The question at this node is, “Did the student’s selections include all other criteria items which haven’t been evaluated elsewhere, but which are deemed essential for an excellent work-up?”*

The standard set for an excellent work-up is usually what would be expected of a resident completing a primary care residency. The information evaluated at this node assesses the questions, physical exams and laboratory tests, and ancillary diagnoses considered essential for an excellent work-up. Items evaluated here should include
questions, exams, labs, treatment, and diagnoses which are expected, but which haven’t been previously selected at other nodal points. This includes one line from all other parts of the diagnosis that weren’t marked as “required” for the Expected Outcome.

**For the Level of Diagnostic Performance**: If the student entered all the criteria items for this node, the student will have the opportunity to move “up” the paradigm to the highest performance level, depending on his/her rating at the Efficiency Node.

If the student failed to include all the criteria items for this node, he/she won’t be able to attain the highest level of performance on this particular DxR case. In this case, the student’s Level of Diagnostic Performance depends on how he/she is rated at the Efficiency Node.

**For the Clinical Reasoning Score**: If the student chose some but not all of the criteria needed to constitute a thorough workup, he/she will receive credit how many of the criteria items he/she included. For example, if the student includes half the criteria items, he/she would receive half the points possible for the Thorough node (default total possible = 15 points).

**Efficiency Node (Within Limits)**

*At this node, the question is “Did the student stay within the efficiency limits set by the case author and/or instructor?”*

One characteristic of an expert clinician is the ability to arrive at a correct diagnosis efficiently. To discourage an unfocused approach to the clinical investigation process, you may place limits on the number of questions that may be asked, exams that may be performed, and lab tests that may be given in a particular case.

If you adjust these limits, choose them broadly enough to allow for a reasonable, thorough investigation, but confined enough to prevent students from simply selecting every possible investigative item at their disposal. Simply telling students that limits exist will often be sufficient encouragement to work through the case in an efficient manner.

**For the Level of Diagnostic Performance**: If the student stayed within the set efficiency limit and still conducted a thorough work-up, he/she will achieve the highest Level of Diagnostic Performance, which is Impressive.

If the student exceeded limits but conducted a thorough work-up, his/her Level of Diagnostic Performance will be Very Good. If the student stayed within the efficiency limits but didn’t achieve a thorough work-up, his/her Level of Diagnostic Performance will be Acceptable. If the student exceeded limits and failed to conduct a thorough work-up, his/her Level of Diagnostic Performance will be Shotgun, denoting a “shotgun” approach to the clinical investigation.

There are no points assigned to this node for the Clinical Reasoning Score.

Now that you understand how the students’ performance is evaluated, you can manipulate the criteria as you wish.
Edit Case Data – Changing Evaluation Criteria

Evaluate Button: Editing Evaluation Criteria
You can change the evaluation criteria for a case online just as you can edit Patient Data. The following pages explain the process of changing the online evaluation criteria for a DxR Case. On the DxR management screen, click Edit Case Data. Select and enter the case you would like to edit. Click Evaluate. You will see a row of buttons corresponding to each part of a DxR case. Below we explain how to edit criteria for each section.

You can also change evaluation criteria in the Record Utility while analyzing student records. See the Record Utility section of this manual for more information.

Diagnosis Button
Click Diagnosis to set the criteria for the Expected Outcome. An Expected Outcome must include the diagnosis, but may also include other information.

List each part of the Expected Outcome separately in the fields marked Part 1, Part 2, etc. (5 or fewer parts). Most cases will have only one or two parts to the correct diagnosis, but space is provided for up to five parts.
Add any acceptable synonyms to each Part, listing each synonym on a separate line. Include as many synonyms and equivalents as possible. This will give the student greater latitude in having a diagnosis scored correctly. For scoring purposes, each synonym is considered equivalent to all other items in that Part. The student’s diagnosis must exactly match any one synonym in that Part to receive credit.

To edit any part of the Expected Outcome, highlight the text you want to change, delete it, and type in the new text. Click Save Changes.

Indicate each Part of the diagnosis that will be Required. The Parts checked as Required will be used in evaluating the first node, the Expected Outcome. The others become part of the criteria for the Thorough level. You must check Required for at least one Part of the Diagnosis.

Optional: You can provide immediate feedback to the student in the form of a brief discussion of the diagnosis if you wish. Type your discussion text in the field labeled “Expected Outcome.” Students can access this information by clicking the Expected Outcome button on the Initial Self-Assessment screen which appears after they have completed the Case.

**Consider, Justify, Competing, and Thorough Buttons**
Review the existing node criteria. Click the button for the node you want to review. A screen will appear, displaying the evaluation criteria as provided by the Case Author. Decide whether you want to modify any of these criteria.

Select items to add. Click the appropriate Interview, Exam Tools, Lab, or Management Category (top of the screen) to see the pull-down menu for each. From these menus, select the proper category (e.g., from Interview you could select the category of questions you want to view. From Examination you could select the exam tool that you want the students to use). Click Get Questions or Get Lab List for the Interview and Lab sections. Choose the specific question, body part, laboratory test, or management option you want to add. Click Retrieve...from Case. You will see the patient response or test result specific to that case.

You have two options in adding material to the node criteria. By clicking Add you add material as a new, separate item; by clicking ‘Or’ Add you add material as an equivalent.

If you enter many items as equivalents, the text will wrap to the next line, but all items are considered to be synonymous.

Type discussion text in the field labeled “Why this item is important.” Students will see this text, along with the patient data when they view the Initial Assessment at the end of the case.

Optional: You can provide comments to your students explaining the evaluation criteria for a node in the “Category Discussion Text.” To edit any existing text, highlight and delete the text you want to change and type in the new information.

As you finish editing the criteria for each node, click Save Changes. The evaluation information for the node will be written to the evaluation database on the server.
One characteristic of an expert clinician is the ability to arrive at a correct diagnosis efficiently. To discourage the student from an unfocused approach to the clinical investigation, a limit is set regarding the number of interview questions, exams, and lab tests that may be ordered before an “efficiency warning” is given. Cases include default limits for all these items. The limit should be broad enough to allow for a reasonable, thorough investigation, but confined enough so that a student merely going down the list of available choices would encounter dialog boxes warning, “You have ___ more questions (exams, labs) before your overall efficiency will be affected.” However, students will be allowed to request additional questions, exams, and lab tests beyond the efficiency limit. It will affect a student’s efficiency scores if he/she exceeds the limits. Efficiency scores may affect the Level of Diagnostic Performance that the student achieves.

**Criteria Count:** If you have added or deleted any criteria items from the various nodes (Consider, Justify, Competing, and Thorough), change the criteria count of interview questions, exams, and lab tests to reflect your changes, making sure to exclude duplicates. Your changes here will update the information in the Initial Assessment the student sees at the end of the case. (These values are rechecked and automatically set by the Record Utility when records are imported.) Click **Save**.
**Changes** when you are finished editing.

**Student Maximum:** Preset counts are shown, but may be edited. Enter the total number of interview questions, exams, lab tests, and management options that students will be allowed to request before exceeding the efficiency limits. Click **Save Changes** when you are finished editing.

**Item Count:** The Item Count entries show the total number of items available in the Diagnostic Reasoning database. Do not change these numbers.

**Lab Cost Allowance:** This is the total dollar amount allowed for lab tests ordered by a student. The preset amount is shown and can be edited. Remember that all lab tests count as individual items. There are no “panels” of lab tests that can be ordered in the Diagnostic Reasoning database. The information on whether students exceed the lab cost allowance will be reported to you in the Record Utility.

*If you have changed the costs of lab tests, you may want to adjust the Lab Cost Allowance.*

Click **Save Changes** when you are satisfied with your entries.

**Paradigm Values:** Diagnostic Reasoning provides different forms of evaluation, but paradigm values affect only the Clinical Reasoning score (100 points maximum).

Default point values for the student’s clinical reasoning score are: Diagnosis Considered = 40 points; Expected Outcome=10 points; Justify Diagnosis=20 points; Competing Hypotheses=15 points; and Thorough Workup=15 points. You may change the numbers here or in the Record Utility. If you change these point values, remember that they must total 100. Click Save Changes when you are satisfied with your entries.

See the Record Utility Section of this manual for more information on changing paradigm values.

### Efficiency

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<thead>
<tr>
<th>Interview</th>
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<tr>
<td>Student Maximum</td>
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</tr>
<tr>
<td>Item Count</td>
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</tbody>
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<table>
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<tr>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria Count</td>
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<td>Student Maximum</td>
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<td>Item Count</td>
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<td>Criteria Count</td>
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<td>Student Maximum</td>
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<td>Item Count</td>
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</table>

<table>
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<th>Paradigm Values</th>
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<tr>
<td>Dx</td>
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<td>Dx Considered</td>
</tr>
<tr>
<td>Justify</td>
</tr>
<tr>
<td>Competing</td>
</tr>
<tr>
<td>Thorough</td>
</tr>
</tbody>
</table>
Diagnostic Reasoning

Management

In this section, you may set the criteria that will be used to evaluate the student’s patient management plan. Patient management items are divided into four categories. They are Required, Recommended, Related H & P, and Related Lab. Students will be evaluated based on entries that match the criteria you set for each category. Later, in the Record Utility, you will set point values for each of the four categories of the management plan. The point values must total 100. Below is a discussion of the types of items that you should list for each of the four areas. (For instructions on editing the point values assigned to the four management areas, see the instructions for Reviewing and Changing the Evaluation Criteria in the Record Utility section of this manual.)

**Required Button**

This area should contain only the treatment criteria items that you would consider necessary for a student to receive a satisfactory score on his/her treatment plan. Select only items from the Management pull-down menu.

**Recommended Button**

This area should contain additional treatment criteria items that would be included in a more complete treatment plan. Select only items from the Management pull-down window.

**Related H&P Button**

The criteria listed here should include Interview and Exam items that the student needs to investigate in relation to the management items selected. For example, if the student were prescribing medication for the patient, he/she would need to ask about allergies, current prescriptions, and over the counter medications currently used. These items may or may not be considered when the student is making his/her diagnosis.

**Related Lab Button**

The criteria items listed here should include all items from the lab section that the student needs to investigate in relation to the management items selected. For example, you may think it’s important to order an EKG or CXR before consulting with a cardiologist. These items may or may not be considered when the student is making his/her diagnosis.

When you are satisfied with your changes to evaluation criteria you can return to the DxR Management screen (click Index) or continue the process of editing case data by changing how the case is presented to students.
Edit Case Data – Presentation Options

You can use the Case Delivery, Query, and Query Management buttons to determine how the case is presented to the student. From the DxR Management screen, click Edit Case Data and then click one of the three buttons shown.

Case Delivery Options Button

Hypotheses Preferences

Associate Hypotheses: Check Associate Hypotheses if you want the students to specify which hypothesis they are pursuing with each interview, physical exam, and lab item requested. The ability to force the students to associate each inquiry item with a specific hypothesis may provide insight into the student’s clinical reasoning.

Review at...: For each Review At box you check, students must enter or review their diagnostic hypotheses (or problem statement) before beginning that area of the investigation.

If you check the Review at Interview box, students will be allowed access to questions in the first Interview category ("Present Illness"). However, they must enter their diagnostic hypotheses before accessing other categories.

Access Preferences

These items enable you to limit access to certain areas and functions of the case.

Interview: Allows access to the interview section of the case.

Exam: Allows access to the exam section of the case.

Lab: Allows access to the lab section of the case.

Show Normals: A check here will automatically display the normal values along with the result of each lab ordered. If you don’t check this box, students will still have access to normal results by clicking the Normal button in the cases.

Management: Allows access to the management section of the case.

Evaluation: Allows access to the initial assessment at the end of each case.

Consultants: Allows access to consultant information contained within the case.

As always, if you make any changes, click Save Changes to preserve your changes.
Query and Query Management Buttons

You may wish to ask students questions at various points in their investigation to enrich their experience in working with a Diagnostic Reasoning case and to stimulate their diagnostic thinking. You can link your questions to specific investigation items using the online query utility. When the student selects an item linked to your question, the patient’s response (or test result) will be displayed first and then the student will be alerted that your question will appear. If the student does not select the investigation item to which your question is linked, the question will still be asked, but it will appear immediately before the student enters a diagnosis.

If the student is required to make an interpretation of the data, the interpretation question will precede the student’s interpretation.

Query Management allows you to link questions to the items in the management section of the Diagnostic Reasoning Cases.

Follow the steps below after clicking either the Query or Query Management button.

Query List Button

Click Query List to see what investigation items are linked to the case you are editing. From this screen you will be able to see and remove existing questions and links. If you remove a question, the link must also be removed. If you wish to add questions, follow the steps on the next page.

Questions

If a question is deleted ALL links to that question MUST also be deleted.

Infectious_Process make TF

Is this a clue to an infectious process? True/False

Temperature can be

Delete

Links

Thermometer|Mouth Infectious_Process

Delete
Multiple Choice, True-False, or Short Answer Buttons
Click Multiple Choice, True-False, or Short Answer to add questions of those types.

a) Select the appropriate investigative tool from the pull-down menu(s) at the top of the screen.

b) Enter a unique Question Identifier (name or title) for your question. This can be anything that you choose.

c) To create links select the desired category from the pull-down menu(s) at the top of the screen. If you select from the Interview or Lab categories, highlight the specific question/lab and click Get Questions or Get Lab List to display your options.

d) Highlight the question, body part, or lab to which you want to link a question.

e) Click Create First Link and the appropriate DxR Code will then be displayed in the links box. If you wish to create additional links to the same question, highlight the next question, body part, or lab desired and click Add Additional Link. If a student selects multiple items linked to the same question, the query will not be repeated.

f) Type your question in the Question box.
   • For multiple choice questions: Enter up to five possible answer choices. Indicate the correct answer by clicking the appropriate radio button for A, B, C, D, or E.
   • For true-false questions: Indicate which of the two answer options is the correct choice by clicking the appropriate radio button.
   • For short-answer questions: You will have to evaluate the student responses individually from the student record.

g) Optional: To provide students with comments about the question after they have answered it, enter your comments into the Comments box. Students will be able to view this information after answering the question.

h) Click “Done” to finish creating your question and link.
Creating Units and Installing Cases

DxR cases are installed into units. If you are teaching a particular set of diagnostic skills or are covering specific subject matter like shortness of breath, you may choose to name your units after the skill or subject matter. If you teach more than one class and/or students at varying levels of education, you may choose to name your units after the classes. You can install the same case in multiple units and set different grading criteria for each instance.

The cases you select will be displayed to students in DxR’s Waiting Room for that unit, or you can provide HTML links from your own web pages directly to specific cases.

You may begin creating units and installing cases within those units at any time after your site is placed on the server and the server is properly configured. Your webmaster or technical support person will use the DxR Setup program tool to first set up your cases and units. The Setup program guides the user through the process of creating a unit, naming it, and installing cases into it. A step-by-step description is included in an appendix of this manual.

If your site is hosted by DxR Development Group, make a list of the cases you want installed, the names of the units you would like to create and a list of all the cases which should be placed in each unit.

If your site is hosted on your institution’s website, you will need to provide your webmaster with a list of the cases you would like him/her to install, the names of any units you would like to create, and the cases that should be contained in those units.

Unit names may be chosen by case subject, course number, or any other cue that will help you remember the unit and its contents.

For example, if you are teaching a unit on respiratory problems, you might choose the Dombkoski and the Elliott cases, since both deal with shortness of breath. If your last name is Doe, you might call your Unit “DoeRespiratory 1” to differentiate it from units that other instructors may have on your site, the other units you have set up, or other units covering the same topic.

You may also restrict who can access a unit and when authorized users can gain access.

See the appendices and the Usernames and Passwords section of this manual for information on how to use these functions.
Analyzing Student Records in the Record Utility

Diagnostic Reasoning’s Record Utility provides you with a detailed analysis of your students’ performance and investigative process. We encourage you to review the student responses, as well as the computer’s analysis of the student’s diagnosis and diagnostic hypotheses list. The review will help you gauge the degree of conformity between your evaluation and that of the computer. Your feedback to the students will be more valuable for your close review of the student’s diagnostic methodology as revealed in their student record. You can change the evaluation criteria and then re-evaluate student performance using the revised criteria. You can also print reports for your review and for students. In addition, the Record Utility can generate statistical information regarding items in the Diagnostic Reasoning database.

Download the Web Version Record Utility

You can download the Record Utility at www.dxrgroup.com by clicking the Downloads link. Select either the Macintosh® or Windows™ version of this utility. This will download, decode, and unstuff the utility on the Macintosh® version. For the Windows™ version, a set-up will be copied to your hard drive. Follow the directions in the set-up to install the Record Utility on the computer.

Convert and Download Records

Since student records are created on the web server but evaluated in the Record Utility which is not a web-based application, you must convert and download the student records to your local computer for evaluation.


Click Record Files. Select the case from which you wish to retrieve records. Click Convert Records. You will see the Source Path, Destination Path, Records, and File Count, or a warning if there is an error.
In the middle of the screen, you will see “Click this link to download your converted records.” Depending on your browser, you may need to click, hold, and save the records you want to download to the rec_util folder that was created when you downloaded the Record Utility. You can also click the link marked here on your screen to download the Record Utility.

Make a copy of the Record Utility if you want to save student records. If the Record Utility has been used for another case, you must remove old student records. Select Clear SARs from the SAR Files menu. You should copy the Record Utility if you intend to save a view student records which have been edited in the Record Utility.

Now you are ready to use the Record Utility.

**Importing Student Activity Records**

Open the Record Utility and click Import SARs.

If you kept a text file of the usernames and passwords you entered in the DxR case, you can import the file into the Record Utility. This enables the Record Utility to display a list of users for whom records can't be found.

Click the pull-down menu that appears under SAR Files, then select Import Student Names List. Navigate to the saved text file containing your student roster. Click Open. (We suggest using the same text file used to create the list in the DxR case.) The roster requires the same format that you used in the DxR case for your username and password list. Spaces can be used in the name, for example: Jennifer Johnson/456-abc. Any combination of letters, numbers, or symbols that can be typed are acceptable for the name or password with the exception of the forward slash “/”.

When you import records, any records not found will be listed in the field labeled SARs Not Found.

In the SAR Files pull down menu, select Import SARs. Navigate to the file containing the student records previously downloaded from your web server. Select and open the file containing the student records you want to import. It may take several minutes to import the records. A window will show the progress in importing and processing the records.
Examining an Individual Student’s Record (Student Record Screen)

Each student activity record contains a complete record of that student’s patient investigation as well as the computer’s evaluation of that record. To navigate to an individual Student Record Screen click the Index button at the bottom of any screen in the Record Utility. You will see a list of the student records currently in the utility.

Click the name of the student whose record you want to see. Use the arrow keys on the keyboard or the First, Previous, Next, and Last buttons to move from one record to another.

Sections of the Student Record Screen

Student Record Information and Summaries

Use the buttons at the top of the screen to display the following information:

- **Complete Record:** A complete item-by-item list of the student’s investigation, including the time of each selection or entry.

- **Items RE: Diagnosis:** Items linked to the Diagnostic Hypothesis and eventually chosen as the basis of the diagnosis

- **Items RE: Hypotheses:** All inquiry items listed according to the Diagnostic Hypotheses the student associated with that hypothesis.

- **Missing Items:** The evaluation criteria items that the student did not include.
Follow-up: The learning issues defined by the student as well as the issues recorded on the management confidence screen.

Notes: The student’s personal notes and SOAP notes.

Use the buttons on the left to view Diagnostic Items, Management Items and Content Knowledge and display the evaluation of each area of the student’s investigation. Check marks to the right of the buttons indicate that the student was successful in that particular area.

Buttons to Edit Student Records

Diagnostic Buttons

Click Diagnosis to see the student’s final diagnosis and the required diagnosis. The Parts of the required diagnosis which are matched in the student’s diagnosis are displayed in bold text. If all parts of the correct diagnosis are matched, the student will receive a satisfactory evaluation.

To override the computer evaluation, click the appropriate Satisfactory/Unsatisfactory radio button to change the computer’s evaluation. The words “Instructor Override” will appear. This will automatically change the scoring for the individual student’s record. You might choose to use the Override function if a student entered the correct diagnosis but either misspelled it or failed to exactly match the wording of any of the accepted synonyms.

Click Hypothesis to see a list of the diagnostic hypotheses the student considered and the correct diagnosis.

Click Yes or No to indicate whether the student included the required items. This selection offers the instructor the opportunity to override the computer’s evaluation (see above).

Optional: You may click one of the four radio buttons to make a qualitative judgement (ranging from Thorough to Vague) about the student’s list.

Click the appropriate button (Consider, Justify, Competing, and Thorough) to reveal the criteria items necessary to receive a satisfactory evaluation for that node. The items in bold were selected by the student. Note that all the items must be bold (selected by the student) to result in a satisfactory evaluation for that node.

Optional: You may make changes to the computer evaluation for these paradigm categories (Nodes) by changing the criteria. (See Reviewing and Changing Evaluation Criteria.) Any changes in criteria you previously made in DxR online will automatically be reflected in the Record Utility.

Evaluations for the Consider, Justify, Competing, and Thorough nodes are fixed to the criteria for each and can not be overridden. To alter these evaluations, adjust the criteria for the category (see instructions under Adjust Criteria).

Management Items Buttons

Each button (Required, Recommended, Related H&P, Related Lab) reveals the items necessary to receive a satisfactory evaluation for that part of the
management section. The items in bold were selected by the student. Note that all the items must be bold (selected by the student) to result in a satisfactory evaluation for that part of the Management section. You may make changes to the computer evaluation for these categories by changing the criteria. (See Reviewing and Changing Evaluation Criteria.)

**Content Knowledge Buttons**

**Statement of Problem:** This button reveals the statement of the problem(s) as listed by the student. The statement of problems is not graded by the computer, so it will be designated as Not Assessed. You may wish to grade and use this information on your own.

**Interpretations:** All interpretations the student made for items within the case can be viewed here. These interpretations are not assessed by the computer but are available for your review and evaluation. (Interpretations may also be listed under the heading of rationales in the text field that appears when you click Interpretations.)

**Questions:** Answers to any question that you included in the case can be viewed here. Answers to short answer questions are not assessed by the computer.

**Notes to Student:** Click this button to open a screen for writing comments to the student. These comments will be printed as part of the student reports you may distribute to students.

**Student and Group Performance**

This area of the student record screen displays basic information about the student’s investigation and how it compares to the performance of the class as a whole.

The lines marked Questions Asked, Exams Performed, and Labs Ordered show the number of items the student requested in each category, the percent of the criteria items the student included in each category, and the class averages. Click the button at the left of each line to see a complete list of the items the student requested.

The hypothesis line shows the number of hypotheses entered by the student as well as the class average. If you made a qualitative evaluation of the student’s hypothesis list (thorough through vague), that evaluation will also be displayed.

The next lines show the relative cost of the labs ordered and the time spent in investigating the case.

Data on whether the student has seen or read about a problem like this before are also shown, compared with percentages for the class.

The student’s confidence in the diagnosis and management are reported.
Evaluation of Student Performance

**Diagnostic Performance:** This displays a general diagnostic performance rating. Click Adjust Criteria to see how the diagnostic performance was determined by the evaluation paradigm.

**Clinical Reasoning Score (CRS):** This is the computer’s numerical evaluation of the student’s performance. The scores from the nodal points are calculated based on the percentage of the criteria items the student included for each node, except in the Expected Outcome (Diagnosis) and Diagnosis Considered nodes, where students are scored on an all-or-nothing basis. For example, under Justify where 20 of 100 points have been assigned, a student who entered 50% of the criteria items would get 10.

**Management Score:** The management score is based on the number of criteria items the student included in his/her management plan and the points assigned to the management section. See the Adjust Criteria section for an explanation.

Overall Student Performance

Overall performance for a DxR case is determined from the Level of Diagnostic Performance and the CRS. For the student to achieve a “satisfactory” overall performance rating, he/she must arrive at the correct diagnosis. Each student’s overall performance is described as excellent, commendable, satisfactory, marginal, or unsatisfactory.

Collecting Statistical Data (Record Statistics Screen)

You may want to collect several types of statistical data that can be gleaned from student records of the Diagnostic Reasoning case. The Record Statistics screen provides detail on how the students in a group performed in the various evaluation nodes. The data from this screen can be useful in determining if a particular criteria item proved problematic for a large number of students or a small number. The screen will also display the number and percentage of students who were evaluated as “satisfactory” in that category or node.

Click Record Statistics at the bottom of any screen in the Record Utility. The criteria categories are listed on the left. Click the category for which you...
want to review statistics (Consider, Justify, Competing and Thorough, or the Management categories of Required, Recommended, Related H & P or Related Lab). The screen will display all criteria items listed for that node/category and the number of students who students who included that item.

Click a criteria item in the list to display the names of the students who did and did not request the item.

Click Return to Last Record to see the student record you were viewing.

Click Print in the lower right of the screen if you want to print information in these fields. To see a print preview, hold down the option (alt) key while clicking Print.

**Performance Ranking Screen**

You can review the overall performance for the class to gain some insight into whether changes in the evaluation paradigm are needed and if so, how such changes would affect the students' performance.

Click Performance Ranking at the bottom of any screen in the Record Utility to go to the Performance Ranking screen.

The Overview displays the number of students achieving each of the 10 Level of Diagnostic Performance – Impressive to Inadequate – as well as the scores for the Management section. The first column of numbers (next to the performance ranking) represents the number of students in each performance category. The numbers under
Lo, Av, and Hi are the lowest, average, and highest Clinical Reasoning Scores (CRS) recorded in that group.

Click a category to view detail of student performance in that particular category. Information exhibited for each student in that Performance level will include: the student name, Clinical Reasoning and Management Scores, the number of Questions, Exams, Labs and total time recorded, and the diagnosis entered by the student. Click the category again or choose a different category to hide the field.

Click Print at the lower right of the screen if you want to print the information shown in these fields. To see a print preview hold down the option (alt) key while clicking Print.

**Adjust Criteria Screen**

At times, you may find it necessary change the criteria used to evaluate all students’ performance. Follow the steps below.

Click Adjust Criteria at the bottom of any screen in the Record Utility to go to the Evaluation Paradigm screen. Click the appropriate button from the top of the Evaluation Paradigm screen to see the criteria for the corresponding category or node. (You can also use the buttons within the Paradigm to navigate to the corresponding category or node.)

Click Diagnosis to see and/or edit the text of the expected outcome and its Parts. If you edit this listing, it will alter the criteria used to evaluate all student records for this case.

Click the appropriate button from the top of the Evaluation Paradigm screen to see the criteria for the corresponding category or node (Consider, Justify, Competing, Thorough, or Limits). Click the button again to hide its data field. Change the evaluation criteria as necessary. You may alter any of the criteria, but you must be careful to use the correct form. Choose one of the two methods below for adding criteria items.

Click the Select Items from Database button, then select a pull-down menu from the top of your screen. A list of the items in the database for that category and/or tool will appear. Select the appropriate item from the pull-down menu. The item will be preceded by its item code. Click New to list the item as a separate new entry, or Equivalent to list the item as an equivalent of an item already listed. Click Save Changes to permanently save your edits.

Click the Edit DxR Codes Directly button to add items by free text entry. Use this option only if you are familiar with the appropriate DxR item code. Most Exam codes are the name of the exam tool followed by the appropriate body part. However, other codes are a bit less predictable. Make sure you have entered the proper code before you save changes. Each criteria item should be listed on a separate line. You should list
Equivalents on the same line, separated by commas. Click Save Changes to permanently preserve your edits.

You may move items between nodal points by cutting and pasting them. Delete items by selecting them and clicking Delete Selected Item.

Click Management to set point values for categories that make up the Management Score. Default scores are loaded. Edit them by highlighting the point value for each category (Required, Recommended, Related H & P and Related Lab) and typing in the new value. The values you choose must total 100.

Click Required, Recommended, Related H & P, or Related Labs to change criteria items within each of those categories of the Management section by the two methods explained above (Select Item from Database or Edit DxR Codes Directly). Remember, Required and Recommended categories should contain only management items from the patient case. Related H & P may contain Interview and Exam items, while Related Lab should contain only Lab items.

If you click Limits to see the Criteria Counts for each node, click Update Criteria Counts to update the number to reflect the criteria changes you just made. (This information will also be updated on the Student Record screen.)

Printing
This function allows you print various types of reports on student performance. The Complete Student Records list will include the names of all students for whom you have records in the Record Utility. The Selected Records list will be empty until you add student names to the list. You can direct the Record Utility to print different data for students in each of these two lists.

Click Index to go to the Index screen. Click Print to see your print options from a pull-down menu. Select the type of data you would like to print for each of the lists. To enter student names into the field marked Selected Records, click the student’s name in the Record List field while holding down the Option (Alt) key. To remove a name, click the name in the Selected Records field.

---

**Basic/Student Reports Include:**
- Student name
- Case name
- Diagnosis items
- DDx List
- Lab list
- Evaluation
- Final diagnosis
- Missing items list
- Notes to student

**Reports by Diagnostic Hypotheses Lists Include:**
- Student name
- Case name
- Diagnosis items
- Diagnostic hypotheses
- Evaluation
- Final diagnosis
- Notes to student
- List of items selected*

*These items are grouped by the hypothesis to which they were linked (i.e., items by Diagnostic Hypothesis field).

**Complete Student Records Include:**
- Student name
- Case name
- Chronological log of student activity while working through case
- Start/Stop times
- Notes to student
- Final diagnosis
**Browser Requirements**

Cookies and Javascript must be enabled. Your browser must also have Apple Computer’s QuickTime 4 plug-in installed. The following browsers are compatible with this program. Using a browser and/or browser version other than one of the following may cause browser crashes and other unpredictable results when using this program.

**Windows**
- Microsoft Internet Explorer version 5.0 or higher
- Netscape Communicator version 4.7 or higher

**Macintosh**
- Microsoft Internet Explorer version 4.5 or higher
- Netscape Communicator version 4.7 or higher

**Screen Size and Monitor Resolution**

Diagnostic Reasoning requires a minimum monitor resolution of 800 x 600 pixels. If your monitor is not set for 800 x 600 pixels or higher resolution, portions of your screen may be cut off and a warning message will appear when you try to log in to the case.

Your monitor must also be set display at least 16 bit color (thousands of colors). If your monitor is not set to display 16 bit or higher color, images and movies may appear distorted, chunky, or washed out on your screen.

**Sound**

PCs must have a sound card. Heart and breath sounds will sound best when heard through headphones.
Appendix 1: Web Server Configuration NT/IIS

The following instructions assume that Windows NT, IIS, Perl 5 or higher, and either the Berkeley DB or GDBM_File dbm have been installed.

1. Through the Windows Explorer, go to the Properties of X:\\InetPub\wwwroot and X:\\InetPub\wwwroot\cgi-bin, and then go to the Security tab. Under this tab, the user IUSR_ <machine_name> should have FULL CONTROL of both folders. Make sure you include the subdirectories by checking the “Replace Permissions in Subdirectories” box in this tab, for BOTH FOLDERS. IUSR_ <machine_name> is the user account through which all of the HTTP requests will come.

2. In IIS itself, use the Action menu to make a new web site. Choose a name for it, then select the IP address for it (usually the local IP of the machine, and usually provided automatically by IIS as one of the drop down selections in that box) and choose the TCP port (usually 80). Then select your home directory (usually X:\\InetPub\wwwroot) and allow anonymous access to the website. Select your permissions, making sure you check Read, Script, Execute, and Write.

3. You should see the cgi-bin directory listed on the right side of the site manager. Right click, select properties, and go to the Directory Tab. Double-check and make sure Read and Write are selected under Access Permissions. Under the Permissions section at the bottom, make sure the Execute (including script) is checked. Click OK.

4. Highlight the web site in the left-hand pane, right-click, and select Properties. Click the Home Directory tab. Confirm that the Home Directory box still has the X:\\InetPub\wwwroot directory entered there. Also, make sure that Read and Write are checked under the Access Permissions section, and that Execute (including script) is selected under the Permissions section. Now, click the Config button, and then go to the App Mappings tab. Make sure there is an entry for the perlis.dll file that is associated to the .pl extension. If not, click ADD and then fill in the following fields.

   Executable: X:\\Perl\bin\perlis.dll

   Extension: .pl

   Make sure the Script Engine checkbox is CHECKED. Leave everything else alone, and add this to the list.

   (X:\\Perl\bin\perlis.dll is the drive and location of your perlis.dll, for example, C:\\Perl\bin\perlis.dll)

5. Make sure the DxR Web site has been STARTED from the ACTION menu in IIS. You may wish to close IIS and restart the computer just to make sure that all changes have taken effect. If you run into problems with the install process outlined in the next steps and have NOT restarted after all of the IIS steps above, restart the computer, go back into IIS and make sure that the DxR web site has been started. You can also double-check all settings in steps 3 and 4 if you wish.

6. Find the Diagnostic_Reasoning.tar file on the DxR CD-ROM. Use a program like WinZip to unzip this. For speedier extraction, you MAY wish to copy this file to the hard drive before actually opening it with WinZip. Otherwise, it could take several minutes to open the file from the CD-ROM itself.

7. When you unzip the .tar file, make sure you KEEP the existing directory structure intact… usually the option of ‘use Folder Names’ does this. With WinZip, you would click the EXTRACT button, then highlight the X:\\InetPub\wwwroot directory in the extract dialog. Then click EXTRACT to begin the unzipping process.

8. Within your X:\\InetPub\wwwroot\cgi-bin, make a directory called DxrSetup. Copy the file dxrSetup.pl from your CD to this sub-directory, and make sure to restrict access to this file.

9. If your server has a domain name and entry on your schools DNS server, or if you will be using an IP number only, you may now proceed to the section: Creating Units and Installing Cases.
IMPORTANT NOTE: Most web browsers will cache the usernames and passwords you type in. To be absolutely certain that no one gains unauthorized access to the management tools or the setup program when you are done with them, quit your browser completely. This will ensure that the next time your browser is started, any attempt to access the secured parts of the site will result in a challenge for the username and password.

Securing your DxRManag Directory:

1. You will need to create a new user; go to Start>Programs>NT Administrative Tools>User Manager for Domains. Create a user of any name and description that is a member of the same domain that IUSR_<machine_name> is a member of.

2. Now, use the NT Explorer to navigate to your DxRManag directory. This is usually located in C:\inetpub\wwwroot\DxR\ Right-click on the DxRManag folder and select properties. Click the Security tab, and then click Permissions.

3. From the list of allowed users, remove the IUSR_<machine_name> user from the list, and add the user you created in step 1, giving that user full control of the directory. Click OK twice to make those changes take effect.

4. Open the IIS Management Console. Use the tree view on the left to open the DxR website you created and navigate down the tree until the DxRManag folder is visible.

5. Right-click on the DxRManag folder and select Properties. Click the Directory Security tab, then click Edit in the Anonymous Access section. Uncheck ‘anonymous access’. Check ‘Basic Authentication’. Click the Edit button to the right of Basic Authentication. Enter the domain that the user in Step 1 belongs to into the box and click OK. Now click OK one more time, and then select the Directory tab. Make sure the following permissions are checked: Read, Write, and Execute.

This will allow only the username you specified in step one to have access to this directory. Be aware that most web browsers will cache the name and password once they are entered. If the computer that is accessing the management tools is student-accessible, be sure to exit the browser completely when done using the tools, else someone could easily use the browser’s history feature to gain access to the tools without being challenged for a password.

Securing the DxRSetup.pl file:

This procedure is almost the same as the above. We will assume that you are using the same user you created for the DxRManag folder for this procedure. You can use a different user if you wish, however. YOU MUST ALREADY HAVE INSTALLED AT LEAST ONE CASE FOR THIS TO WORK.

1. Use NT Explorer to navigate to the cgi-bin directory where the dxrSetup.pl file is located. Make a new folder within cgi-bin; you may name it whatever you wish. We will call it SECURE for the purposes of the procedure.

2. Copy the dxrSetup.pl and the setup.db files into the SECURE directory.

3. Right click the SECURE directory and access its properties. Go to the Security tab, then click the Permissions button. Remove the IUSR_<machine_name> from the list of allowed user, and add the user you created for the DxRManag procedure (or another user), giving that user Full Control of the directory. Click OK twice to make those changes take effect.

4. Open the IIS Management Console. Use the tree view on the left to navigate through the site until you find the SECURE folder under the cgi-bin folder.

5. Right-click on the SECURE folder and select Properties. Click the Directory Security...
tab, then click Edit in the Anonymous Access section. Uncheck ‘allow anonymous access’ and check ‘Basic Authentication’. Click the Edit button to the right of Basic Authentication. Enter the domain that the user you used in step 3 above. Click OK, then click the Directory tab. Set the permissions as follows: Allow Read and Write, and disallow Execute.

6. The new URL to get to the DxRSetup program will now be: http://<your_site_here>/cgi-bin/SECURE/dxrSetup.pl. Anyone trying to get to that address will be challenged for the name and password of the user that has access to that folder (the user from Step 3). Be aware that the same browser caching issues apply for this setup as well, so be sure to close any browser used for setup after the setup has been completed.

**Review of IIS Permissions by directory:**
Allow for Read-ONLY: cgi-bin/SECURE (must be done after at least one case has been installed)

Allow for Read, Write, and Execute: DxRManage

Allow for Read: all other directories for the DxR software.

**Directory Security Settings for IIS:**
cgi-bin/SECURE = No anonymous access

DxRManage = No anonymous access

all other DxR-associated directories = Allow anonymous access

**Windows NT Permissions set through NT Explorer:**
User account created for setup and admin tools: Full Control of cgi-bin/SECURE

DxRManage IUSR_<machine_name> account: Full Control all other DxR directories.
Appendix 2: Web Server Configuration Unix/Apache

Installing Diagnostic Reasoning under Apache, Option 1
The actual location of the Apache web server, its configuration file, log files, cgi-bin and HTML documents will vary from system to system. Using Linux as an example, the log and configuration files will likely be under /etc/httpd.

Using the default Apache directory structure, you will be installing the Diagnostic Reasoning Program in the directory Apache identifies as the DocumentRoot. To continue with Linux as our example, the document root is called “html,” and you will be looking at a directory structure like this:

```
/home/httpd/
    cgi-bin/
    html/
/etc/httpd/
    logs/
    conf/
```

In this scenario, we address a server that may or may not already have other web pages and sites, but which is still using the default Apache configuration file and directory structure, and is not using Virtual Hosting.

Insert and mount the Diagnostic Reasoning CD.

1. Untar/unstuff the compressed DiagnosticReasoning.tar/Diagnostic_Reasoning.sea file into the “html” directory (or your server’s equivalent).
2. Make a directory within your existing cgi-bin, called DxRSetup, and restrict access to it in the same manner described below for protecting DxR Management. Copy the dxrSetup.pl into this directory, and set its permissions to be executable (chmod 0555 dxrSetup.pl).
3. Using the Linux example above, your Apache directory structure should look like this:

```
/home/httpd/
    cgi-bin/
        DxRSetup/ (this directory should be password-protected)
        dxrSetup.pl
    html/
        Diagnostic_Reasoning/
        icons/
/etc/httpd/
    logs/
    conf/
```

4. Diagnostic Reasoning expects the cgi-bin to be in a particular place in relationship to the rest of the program’s files, and in this scenario, the cgi-bin is in the “wrong” place. To correct this, without disabling existing sites or reconfiguring Apache, you will need to create a symbolic link to your server’s real cgi-bin. Continuing with the Linux example, navigate into the html directory and enter a command like the following:

```
ln -s /home/httpd/cgi-bin cgi-bin
```

where `ln -s` makes a symlink, `/home/httpd/cgi-bin` is the target, i.e. your real cgi-bin, and cgi-bin is the name of your link to the cgi-bin. You will have to make
sure that the path to the target cgi-bin matches your system.

5. If your server already has a domain name, and a DNS entry on your institution's DNS server, or if you are using an IP number instead of a domain name, you can proceed to Securing DxR Management. Prior to installing your first Unit and Cases, your directory structure will look something like this:

```
/home/httpd/
cgi-bin/
    DxRSetup/ (this directory should be password-protected)
    dxrSetup.pl
html/
    Diagnostic_Reasoning/
    cgi-bin (the link to the real cgi-bin)
icons/
/etc/httpd/
    conf/
    logs/
```

After installing your first unit and cases, the directory structure will look like this:

```
/home/httpd/
cgi-bin/
    dxrSetup.pl
    DxR
html/
    Diagnostic_Reasoning/
    cgi-bin (the link to the real cgi-bin)
    DxR/
    dxrPatnt/
    dxrElem/
    index.html (this will be called dxr.html if there is a pre-existing index.html page)
icons/
/etc/httpd/
    conf/
    logs/
```

**Installing Diagnostic Reasoning under Apache, Option 2**

The Apache web server provides two ways to host multiple web sites on a single server and to keep each site and their many parts separated from each other. These are VirtualHost and NameVirtualHost. With a VirtualHost, each site on the server has both a unique name, such as: http://dxr.your_school.your_university.edu as well as a unique IP number. The VirtualHost entry for such a site in the Apache configuration file would look something like this:

```
<VirtualHost dxr.your_school.your_university.edu>
    ServerAdmin webmaster@dxr.your_school.your_university.edu
    DocumentRoot /home/html/dxr
    ServerName dxr.your_school.your_university.edu
    ErrorLog logs/medschoolsites/dxr-error_log
    CustomLog logs/medschoolsites/dxr-access_log common
</VirtualHost>
```
In NameVirtualHost, the configuration file entry is almost identical, with the exception that the VirtualHost entry is immediately preceeded by a NameVirtualHost statement. The NameVirtualHost statement must include the IP address you wish to use (i.e. NameVirtualHost 111.222.333.444). In this setup, the server has a single IP number, yet still serves multiple sites with multiple names.

In this scenario, we will use the same Linux directory structure described in Option 1 (above), and assume you will be putting your Diagnostic Reasoning Virtual Host in a directory called “dxr” inside of your server’s DocumentRoot directory.

1. Make the directory for the site, make a cgi-bin directory within it, and within the cgi-bin, make a directory called DxRSetup. Password-protect this last directory.
2. Untar/unstuff the compressed DiagnosticReasoning.tar/Diagnostic_Reasoning.sea file into the “dxr” directory you just created.
3. Copy the dxrSetup.pl file to DxRSetup, and set its owner and group to be the same that of the Apache process, and set its permissions to be executable (chmod 0555 dxrSetup.pl).
4. Using the Linux example above, your Apache directory structure should look like this:
   ```
   home/html/
   dxr/
   \ Diagnostic_Reasoning
   \cgi-bin/ (this directory should be password-protected)
   \ DxRSetup/ dxrSetup.pl
   \ cgi-bin/ (you don’t use this cgi-bin for your DxR site)
   icons/
   etc/httpd/
   logs
   conf
   ```
5. Now is the best time for you to add the VirtualHost entry to your Apache configuration file (see above).
6. If your server already has a domain name, and a DNS entry on your institution’s DNS server, you can proceed to Securing DxR Management. After installing your first Unit, the directory structure will look like this:
   ```
   home/html/
   dxr/
   \ Diagnostic_Reasoning
   \cgi-bin/ (this directory should be password-protected)
   \ DxRSetup/ dxrSetup.pl
   \ DxR/
   ```
Installing Diagnostic Reasoning under Apache, Option 3

As the Apache configuration file states: “symbolic links and aliases may be used to point to other locations.” While DxR supports the installation and configuration setups described in this document, there are, in fact, other ways to install Diagnostic Reasoning on your server. You must keep in mind, however, that the program contains many relative paths to a ../cgi-bin/DxR/ directory, and thus requires either a particular directory structure, the use of VirtualHosting, or some other method to allow the html files and the ../cgi-bin/DxR/ directory to find each other, such as the use of symlinks or aliases. If you use another configuration, please test the program thoroughly before students begin working on cases. While a brief review of the program may indicate that it is functioning normally, some functions of the program, including the creation of student records, may not work if all the parts of the program are not able to communicate with each other.

Securing DxR Management

Your site includes the DxR Management tool, which allows instructors to rebuild the patient databases, allow or deny access to the Cases, download student records and edit case data. We strongly recommend restricting access to this part of the site, using the htpasswd utility of Apache. The first time you run the dxrSetup.pl program it will create the DxR Management section of your site, which will be located at: yoursite/DxR/DxRManag. Therefore the Apache configuration file entry to restrict access to this portion of the site will be something like:

```xml
<Directory /home/html/dxr/DxR/DxRManag>
  AllowOverride AuthConfig FileInfo Indexes Limit Options
  AuthUserFile /etc/access/.dxr
  AuthName “servername”
  AuthType Basic
  require user admin instructor
</Directory>
```

The command htpasswd -c /etc/access/.dxr admin will create the invisible file “.dxr”, and then prompt you for a password for the user “admin”. To add the second user, “instructor”, use the command htpasswd /etc/access/.dxr instructor, leaving out the “-c” option. You will again be prompted for a password.