One of my favorite cartoons shows two scientists in a physics laboratory. On the blackboard, they have written a complicated formula on the left side and a complicated formula on the right side, connected with the words “then a miracle happens”. One of the scientists points to the words and says to the other, “I think we should be a little more explicit here in step two”.

This issue of the Journal is devoted to being a little more explicit about the miracle that occurs in expert systems. In this issue, Dr. DeTore offers an eloquent explanation of expert system fundamentals. Dr. Burt argues that expert systems can be useful in several kinds of projects; the objectives must be clear before the expert system is designed. Paul Howman shares MONY’s experience in developing and implementing an underwriting system; and Dr. Shirouzu describes the growth and function of the system used at Nippon Life in Tokyo. In another article, Ross Morton writes about underwriters and expert systems. Last, but not least, the designers of Dr. ClaimTM give an account of their claims paying system.

Expert systems address many important underwriting needs. They will improve the consistency of decisions. They will improve time service for many cases. They will be excellent training tools. They will eliminate routine work and, therefore, improve productivity for non-medically underwritten cases. But, while acknowledging the capabilities of expert systems, the limitations also must be noted.

The term “expert system” implies that the insurance application goes in one end of the machine and the rating comes out at the other. This is true only for the simplest applications. “Expert system” also implies that its primary objective is to simulate the expert, i.e., the experienced underwriter or medical director. Presently, the role of most expert systems is primarily administrating, not underwriting. Conceptually, most expert systems consist of an “underwriter administrator system” which issues clean cases and orders requirements. It refers anything but the simplest application to an underwriter who then consults the “underwriter advisor system.” This is the portion of the expert system which deals with medical impairments, but only after being fed detailed information from the underwriter.

It is my opinion that the portion of any expert system devoted to underwriting medical impairments will be limited in its ability to increase productivity until major changes are made in the way information is processed from the application, exam, and APS. I believe that silicon brains can simulate carbon brains in many ways, including the thinking techniques of underwriters and medical directors. The problem is not with expert systems. It is with inputting. Medical underwriters spend the majority of their time extracting information from the application, exam, or attending physician statement (APS). Once we have all of this information, it actually takes little time to reach a decision. The relationship of underwriters to expert systems is similar to the relationship between an intern and the intern’s supervising attending physician.

Expert systems work best when they are treated like medical school attendings during rounds. The intern gives the history, physical findings, and lab findings in a thorough, methodical, predetermined order. (For example, on OB rounds: “This 36 year old gravida I, para I whose last menstrual period was...”). With all of this information, the attending decides the appropriate action. A medical-school-professor expert system would not save much time for the harried intern. The information gathering and sorting would still have to be performed: The slow process of extracting verbal information from the patient; the time of a thorough physical; the walk up to radiology and down to the lab. Gathering and sorting underwriting information is a similar process and occurs on four levels.

On level I, the application is read. If all of the boxes are checked “no”, the policy is issued. I think of this level as the “optical reader level” since machines designed to read pencil-filled ovals could do this. If there is any written information (for example, “COLD, saw Dr. Young, a pulmonologist”), the case goes to the next level, the “underwriter level.” At this point, the underwriter serves as a "expert reader." For example, the reader-underwriter would recognize that “COLD” could mean chronic obstructive lung disease and that colds are usually not treated by a pulmonologist. In MONY’s system, apparently, a clerk can enter this information and the expert system can interpret these subtleties. For a direct insurer, this level is very important; much time and money is wasted if an APS is ordered frivolously or conversely, is not ordered, with consequent poor mortality. For a reinsurer, this level is less important; by the time they get the case, an APS and other information is already in. But for most of us, information arrives in pieces. Deciding to obtain an APS or blood or urine or EKG or treadmill is based on sketchy data on the application or exam. At the end of level II, either the policy is issued or more information is requested.

Level III is the “intern stage”. The underwriter must slog through thick APSs, trying to decipher physician’s handwriting. Medical directors must flip through pages of nurse’s notes to look for technical studies. Then these studies must be read...
<table>
<thead>
<tr>
<th>Level</th>
<th>Function</th>
<th>Level of Data Entry</th>
<th>Expertise Level</th>
<th>Adaptability to Expert System</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Administration and clean case screening</td>
<td>Application</td>
<td>Optical reader</td>
<td>Excellent</td>
</tr>
<tr>
<td>II</td>
<td>Order requirements Evaluate results</td>
<td>System to system (MIB,HOBP/HOS, inspections)</td>
<td>Expert reader</td>
<td>Fair</td>
</tr>
<tr>
<td>III</td>
<td>Extract and organize pertinent medical information</td>
<td>Underwriter or MD interacting with system, answering questions, providing data not available in system data bank</td>
<td>“Intern”</td>
<td>Poor</td>
</tr>
<tr>
<td>IV</td>
<td>Make rating decision</td>
<td>Data already entered</td>
<td>“Attending Physician”</td>
<td>Good</td>
</tr>
</tbody>
</table>

and each item noted (for example, a cardiac catheterization report read as “within normal limits” might contain a left ventricular end diastolic pressure of 25 noted only by a medical director).

Only after this careful collection, interpretation, and organization has been done can decisions be made. In the paper world, pages in the manual are flipped and tables referred to. In an electronic world, the expert system would easily locate this information and generate the decision. But how long does it take to look up the rating for a Stage I ductal carcinoma of the breast? Probably less time than it took to flip through the chart looking for the pathology report that told you it was Stage I.

This observation should not be interpreted as meaning I am negative about expert systems. I am not. Some levels of the underwriting process may be well served by expert systems. MIB codes, blood profiles, and urinalysis results will be matched electronically with the appropriate file. The expert system will evaluate the results. If application information is entered directly at the point of sale (i.e., through an agent’s lap-top computer), an answer to a medical question may trigger additional questions. This would help categorize the risk and improve productivity. But, for now, an expert system is only an underwriting tool much like a medical impairment manual.

The problem is “information entry,” a form of data entry. Time required to extract information from exams and APSs is too great to allow expert systems to make a significant dent in the amount of time an underwriter spends on a medically underwritten case. This problem may be solved by a new way of getting exams or filling out APSs. Or it may be solved by a quantum leap in a related field, such as image processing.

Each technology has its limits. For example, the expanding field of genetic research has fostered new hybrids with amazing capabilities. As our soil erodes, perhaps these new genetic crop types will be equally productive in good soil or bad soil. I tried this theory out on an elderly seasoned agronomist. “Son”, he told me, “as long as plants have roots, good soil will be needed.” And as long as exams, APSs, and applications are poorly organized, haphazard, and hand-written, human readers will be needed.

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