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AIR FORCE HEALTH CARE PROVIDERS: AUTOMATION CONCERNS RELATING TO NEEDS, EXPERIENCE, AND SUPPORT

Report By
Captain Michael L. Perry
HQ USAF/SGSIW

22 May 1987
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Executive Summary

This study suggests that the most requested medical computer systems within the Air Force medical community are those that support test results, medical records, and patient scheduling. Although those results change when the data is viewed by different medical specialties, they still remain in very high demand.

Overall, there is no correlation between military grade and computer support or military grade and computer experience. There is, however, a correlation between medical specialty and computer support and computer experience. However, the correlation appears driven by computer education. This implies that educating key staff in computer related subjects can play a major role in gaining support for medical computer applications.
AIR FORCE HEALTH CARE PROVIDERS: AUTOMATION CONCERNS RELATING TO NEEDS, EXPERIENCE, AND SUPPORT

Introduction

The Organization

The Department of the Air Force was established and made a part of the Department of Defense by the National Security Act of 1947 and by the terms of that Act came into legal being on September 18, 1947. The organizational structure of the Air Force is designed around a functional and geographical pattern. Functionally, the Air Force organization may be classified as offensive, defensive, supporting, training, and research. (See Appendix A and Figure 1.) Geographically, a single command may be responsible for two or more functional elements.

The Air Forces' primary functions are to organize, train, and equip Air Force forces for the conduct of prompt and sustained combat operations in the air.

The Air Force Medical Field plays a supporting role in this function. Primarily, its functions are to maintain the health of Air Force forces, to ensure maximum wartime readiness, and to be combat capable. It will also provide, to the greatest extent possible, a peacetime health care system for all beneficiaries. In order to do this, it is organized to support the Air Staff as noted in Figure 2 and to support geographically dispersed bases as noted in Figure 3.
In order to carry out the Air Force mission, it has an active duty force of approximately 600,000 (Air Force Magazine, 1986). This active duty force makes up only a portion of the total beneficiary population. Adding other beneficiaries, such as retirees and dependent family members, increases the beneficiary population to approximately three million in the Air Force and nine million Department of Defense-wide.

In order to meet the mission requirements and give these beneficiaries the high quality of health care expected, the Medical Field employs a staff of approximately 53,000 (Air Force Magazine, 1986). The staff is designed to cover most, if not all, unique Air Force military medical needs. In addition to the administrative corps, nursing corps, and dental corps, and according to the Air Force Clinical Consultant Division, Headquarters United States Air Force, the medical field has a large contingency of health care providers representing various medical specialties. (See Appendix B for list.)

The Problem

The geographically dispersed medical treatment facilities as noted in Figure 3, the large transient beneficiary population as noted above, the limited number of selected medical specialists on active duty as cited by the United States Medical Recruiting Service, and the variety of
medical needs due to these factors, make the needs of the Air Force health care providers especially unique. For example, a patient could contact malaria while stationed in another part of the world and later be transferred to Blytheville Air Force Base, Arkansas prior to the symptoms manifesting themselves. Once at the new location, the condition may become acute and require medical care; consequently, the Air Force health care providers must be aware of, not only conditions indigenous to the United States, but other countries, as well.

Another need centers around wartime applications where the medical field must plan, develop and practice wartime medicine. For example, different medical stations must be set up to handle and transfer the wounded. Helicopters pick up the wounded on the front lines and transfer them to staging areas. After stabilization, the patients are transferred to facilities with more definitive care capabilities; until finally, they may end up in United States hospitals. This requires coordinating the transfer of the patients, medical records, health care providers, and supplies.

These diversified and unique health care provider systems are being met through the use of computers, such as the computer assisted processing of cardiograms found in Appendix C. Unfortunately, many of these needs have been
addressed through a top down approach as noted in the Department of Defense Directive (DOD) Directive Number 6000.5 (June 11, 1976); DOD Directive Number 5136.1 (October 5, 1984); and House of Representatives H. R. 4428 (June 25, 1986). The needs of these agencies, instead of the needs of the health care providers, are driving the development of these medical computer systems. Thus, the majority of medical computer systems listed below have been or are being brought on-line with limited user involvement. (See Appendix C for systems names and explanations.)

It appears that most of the health care providers' medical computer needs, computer experience, and support nonsupport of these medical computer systems have not been directly addressed. For example, I have traveled to several medical treatment facilities worldwide and have found that medical computer systems that are very seldom, if at all, used. This limited use appears to be the symptom. The problem, as mentioned, seems to be that the medical computer systems do not meet the users needs or are too complicated for them to use without extensive training. This seems to translate into a lack of support by the users which is making it difficult to manage existing medical computer systems and to plan and implement future medical computer systems.

**Project Deliverable**

The project deliverable will be a one to two page
position paper as outlined in *Tongue and Quill: Communication To Manage In Tomorrow's Air Force* (July 19, 1982) and used as an introduction to evaluate my proposal. (See Appendix D for position paper.) A position paper is written to take a stand on an issue. The concluding paragraph will contain a specific recommendation for action.

The position paper will be submitted to the Air Force Medical Service Information Systems Division and the Department of Defense's Medical Systems Support Center. The following people will most likely decide whether my recommendations have merit:

Colonel Charles W. B. Morrison  
Chief, Medical Service  
Information Systems Division  
Office of the Surgeon General

Michael J. Mestrovich, PhD  
Director  
Department of Defense's Medical Systems Support Center

If the Air Force accepts my recommendation, it could directly impact 82 hospitals and 39 clinics worldwide; indirectly it could affect approximately three million beneficiaries. If the Department of Defense accepts my recommendation, it could directly impact 168 hospitals and 300 clinics worldwide; indirectly it could affect approximately nine million beneficiaries.
The factors by which the Air Force and Department of Defense would judge my recommendation are as follows:

a) They would review Air Force Inspector General and major command complaints that relate to health care, specifically automation and lack of automation. In so doing, they would have insured that I addressed a problem and not its symptom and that my approach is understandable.

b) They would look at the feasibility of my recommendations. Specifically, is it cost effective, technologically feasible, and politically viable.

c) They would check the validity and reliability of my survey instrument.

d) Finally, they would review my analysis.

If my recommendation is accepted, it would be used in developing the Air Force Medical Service Information Systems Division's Medical Service Information Systems Five Year Plan and as input into the Department of Defense's Medical Systems Support Center's Planning, Programming, and Budgeting System process.

Approach

Overview

The objectives of this project are to ascertain the computer needs of medical health care providers. This will be done by medical specialty and military grade. For example, neurosurgeons may have a greater need for
medical expert systems while family practitioners may have a greater need for automated medical records. In addition, the demand will be broken down by military grade. For example, colonels may not find differential diagnostic trees helpful while captains who have not been practicing as long may find them useful. Consequently, a certain system may have to be aimed at certain groups.

A second purpose is to analyze the computer experience of the health care providers. In so doing, their experience will be correlated against their medical specialty and military grade.

The final purpose is to analyze whether they will support existing and proposed medical computer systems. I plan to look at the correlation between who supports automation and their medical specialty and military grade. For example, junior medical officers, such as captains and majors, may be more inclined to support automation, due to recent use of computers in school; while more senior medical officers, such as lieutenant colonels and colonels, may not have had that experience and thus my be less supportive. This being the case, the implementation of certain medical computer systems may have to be postponed until the senior medical officers' attitudes change through education or they
leave the Air Force through attrition.

A survey instrument will be used to capture this data. Using a stratified sample, the survey will be sent to one large hospital, one small hospital, and one clinic for each major command.\(^2\) (See Appendix E for the list of 28 medical treatment facilities that will be contacted.) A total of approximately 1200 health care providers, or ten percent of the total military health care provider population, will be surveyed\(^3\).

Method

Several systematic steps will be required to produce the end product of this study. Those steps are as follows:

**Gather Data.** Oppenheim's *Questionnaire Design and Attitude Measurement* (1976) and Stone's *Research Methods in Organizational Behavior* (1978) were used as guides in developing and conducting interviews with the health care providers in the Clinical Consultants Division, Office of the Surgeon General. (See Appendix F for names.) Doctors Quintana (Colonel) and Opsut, Senior Health Services Analysts, Health Affairs and Plans Division, Office of the Surgeon General, reviewed the survey and made recommendations. The final close-ended survey was tested at the Bolling Air Force Base's medical treatment facility.
In addition, the close-ended survey (Appendix G) was forwarded to Headquarters Air Force Manpower Personnel Center/DPMYOS, Randolph Air Force Base, Texas for review and Air Force approval. This survey was forwarded, along with a cover letter (see Appendix H), in accordance with Air Force Regulations 12-30 Air Force Freedom of Information Act Program, 12-35 Air Force Privacy Act Program and 30-23 Air Force Personnel Survey Program. This approval was required by the Air Force prior to any survey being administered to its personnel.

Following approval of my plan, the survey will be sent via a staff summary sheet (see Appendix I) to the Air Force Clinical Consultants Division, the Air Force Aerospace Medical Consultants Division, the Air Force Medical Service Information Systems Division, and the Chief, Air Force Medical Service Corps for review and coordination. Upon completion, it will be forwarded to Brigadier General DeHart, Director of Professional Affairs and Quality Assurance, United States Air Force, Office of the Surgeon General, for review, approval, and signature. ⁴

General DeHart's letter, along with the survey, will be sent to the medical treatment facilities identified in Appendix E. At these facilities, the survey will be photocopied and distributed to all health
care providers. Upon completion of the survey, it will be sent to the Resource Manager at each facility who, in turn, will forward it to me at the Air Force Medical Service Information Systems Division, Liaison Office, Bolling Air Force Base, Washington DC.

**Analysis.** The analysis will be approached as follows:

1) First, I will analyze question 10, Appendix G in order to list the top three medical computer systems requested by the health care providers. In so doing, I will assign a weighted value to each of the three selections. More specifically, the first, second, and third selections for each respondent will have values of three, two, and one respectively. These weighted selections will be added together with their identical selections from other respondents. Thus, the top three medical computer systems will be identified. In addition, these top three choices will be displayed further by medical specialty. Consequently, in addition to showing which medical computer systems the medical users want, it will also show if there is a difference in needs among the different medical specialties and military grades.

2) Secondly, I will use an analysis of variance\(^5\) (ANOVA) process in order to analyze the results.
Responses to questions number one, five, six, seven, eight, and nine of Appendix G will be added together to develop a variable labeled "degree of support". Responses to questions two, three, and four will be added together to develop a variable labeled "degree of experience". Both support and experience will be examined to determine if there are any differences based on medical specialty or military grade.

Some specialties, such as neurology, are limited in number. Thus, a representative sample for that specific specialty is unlikely. Consequently, the specialties will be divided into groups. For example, one group will consist of continuing care health care providers such as internists, pediatricians, family practitioners, gynecologists, etc., while the other group would consist of the more high technology based providers of care such as neurologists, cardiologists, radiologists, etc.

An analysis of variance will be used to test, using an alpha level of 0.05, the hypothesis of equal measure for the two specialty groups for support and experience. The null hypotheses are as follows:

a) $H_0$: There is no difference in the way support is viewed by different medical specialists.

b) $H_0$: There is no difference in the way support is viewed by different military grades.
c) $H_0$: There is no difference in computer experience among different medical specialists.

d) $H_0$: There is no difference in computer experience among different military grades.

Through ANOVA, I will be able to analyze if support and experience differs by medical specialty or military grade. If it does, then my position paper recommendation would use this information as a justification in aiming change mechanisms at certain medical specialties and military grades.

3) Because grade and experience and specialty and experience are most likely highly correlated, it is necessary to examine their separate and common effects on support. A Two-way ANOVA is needed to understand this statistical significance of interaction effects. In so doing, I will analyze support and experience while holding medical specialty constant; and support and experience while holding military grade constant. Again, the specialties will be divided into groups. The same questions and alpha level, as noted above for the ANOVA, will be used.

The null hypotheses are as follows:

a) $H_0$: Interaction effects are zero: The mean difference in main effects of support and experience is the same for all medical specialties.

b) $H_0$: Interaction effects are zero: The mean difference in main effects of support and experience is the same for all military grades.
This analysis will allow me to understand the relationship among all variables better. That is, is the relationship between support and experience and needs and experience effected by medical specialty and military grade? In either case, I will be in a better position to make my recommendations.

Recommendation. My recommendation will be covered in my position paper and will address the type of medical computer systems the health care providers would like to use, the medical specialists and military grades that may need computer training, and which medical specialists and military grades may need encouragement in changing from their positions of nonsupport of medical computer systems to support.

More specifically, my recommendations will be as follows:

1) Implement the first, second, and third medical computer systems chosen by the users. Suggest any other medical computer systems requested by a certain specialty be given further study.

2) If the null hypothesis for $H_0$ is true, then I will recommend that all specialists be managed similarly. If it is not true, then I will recommend that medical specialists be managed individually.
3) If the null hypothesis for $2_b$ is true, then I will recommend that all military grades be managed similarly. If it is not true, then I will recommend that personnel within different military grades be managed differently.

4) If the null hypothesis for $2_c$ is true, then I will recommend that computer education be treated equally among all medical specialties. If it is not true, then I will recommend that computer education be managed differently within each medical specialty.

5) If the null hypothesis for $2_d$ is true, then I will recommend that computer education be treated equally among all military grades. If it is not true, then I will recommend that computer education be managed differently within each military grade.

6) If the null hypothesis for $3_a$ is true, then medical specialties have no effect on experience relating to support. Therefore, I would recommend that the treatment of support through education be treated equally throughout all medical specialties. If it is not true, then I would recommend that the treatment of support through education be aimed at medical specialties.

7) If the null hypothesis for $3_b$ is true, then military grades have no effect on experience
relating to support. Therefore, I would recommend that the treatment of support through education be treated equally throughout all military grades. If it is not true, then I would recommend that the treatment of support through education be aimed at military grades.

Results

The results are addressed as follows: First, the requested medical computer systems are listed. Next, the hypotheses that relate to experience and support are listed. For each, the decision and rationale are noted; cautions one should be aware of and finally implications of the decisions, follow. Finally, the implications are summarized and addressed in the Summary section that follows.

Requested Medical Systems

Question. What are the top three medical computer systems requested by health care providers?

Answer. The top three medical computer systems requested by health care providers (as a group) are as follows:

1) Test Results
2) Medical Records
3) Patient Scheduling/Follow-up Appointments

Rationale. The rationale is based upon the answers (Note Appendix J for database) to question number ten:
Question 10.

Review the functions listed below. Write the number "1" next to the function that you believe a computer system would make easier or more productive, place the number "2" next to your second choice and a number "3" next to your final choice. (Make only three selections.)

() Cases Done Listing
() Clinical Management Tool
() Research
() Continuing Medical Education Rec.
() Quality Assurance
() Medical Records
() Recovery Listing
() Patient Medications
() Test Results
() Medical Literature
() Patient Scheduling/Follow-up
() Military / Personal Appointments
() Differential Diagnostic Tree
() Medical Expert System - Verify
() Medical Expert System - Remind
() Other

The first, second, and third selections for each response have weights of three, two, and one respectively. The selections were added together giving a total cumulative value for all respondents for each selection. The input was weighted and processed through SPSS and Lotus 1-2-3, giving the results as follows:

<table>
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<tr>
<td>Medical Records</td>
<td>346</td>
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<tr>
<td>Patient Scheduling</td>
<td>290</td>
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</table>

(See Appendix K for a complete listing.)

Question (Part B). What are the top three medical systems selected by medical specialty?
Decision. The top three medical computers systems requested by medical specialty are as follows:

<table>
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<th>Weight</th>
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<tr>
<td>1) Biomedical⁷:</td>
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<tr>
<td>a) Test Results</td>
<td>13</td>
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<td>b) Research</td>
<td>9</td>
</tr>
<tr>
<td>c) Medical Literature</td>
<td>9</td>
</tr>
<tr>
<td>2) Physician Assistant⁷:</td>
<td></td>
</tr>
<tr>
<td>a) Patient Scheduling</td>
<td>54</td>
</tr>
<tr>
<td>b) Medical Records</td>
<td>52</td>
</tr>
<tr>
<td>c) Test Results</td>
<td>51</td>
</tr>
<tr>
<td>3) Medicine⁷:</td>
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<td>a) Test Results</td>
<td>193</td>
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<tr>
<td>b) Medical Records</td>
<td>99</td>
</tr>
<tr>
<td>c) Medical Literature</td>
<td>99</td>
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<tr>
<td>4) Surgeons⁷:</td>
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</tr>
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<td>a) Test Results</td>
<td>59</td>
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<tr>
<td>b) Patient Scheduling</td>
<td>47</td>
</tr>
<tr>
<td>c) Medical Literature</td>
<td>47</td>
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<td>5) Clinicians⁷:</td>
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<td>a) Test Results</td>
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<td>6) Allergists⁷:</td>
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<td>b) Clinical Management Tool</td>
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<td>7) Nurses⁷:</td>
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<td>c) Medical Records</td>
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</table>
Cautions. Survey results may only show what is needed today for automation support and not look at future needs. To prevent this problem, it is necessary to focus on future information needs.

Furthermore, respondents may not know enough about what the different medical computer systems can do. Thus, their responses may not address a realistic application.

The weighted values assigned to choice one, two, and three may not represent the true difference between choices. That is, the most needed medical computer system may not be twice as important as the second most needed.

The responses came from many different medical treatment facilities. Some of these facilities have some of the medical computer systems listed in the survey. Thus, a respondent may choose a less important medical computer system for his or her response. To deal with this issue, facilities would have to be added to the database and matched against the medical computers systems found in Appendix C.

About 300 surveys are expected to arrive after the database is initially built and the statistical programs executed. These missing responses could add to the statistical significance. Regardless, there appears to
have been enough responses, in most areas, to give this survey a 95% confidence level.

Implications. The results suggest that the current level of automation for test results is not fulfilling the desires of the health care providers. Therefore, this area must be looked at closer.

The demand for automation of medical records continues to be high on health care providers' list. Unfortunately, the cost appears to be too high to be viable at this time. With the advent of greater hardware and software capabilities at lower cost, this would become be feasible.

Patient scheduling/follow-up appointments is a concern that the author did not expect. Currently, when a health care provider tells a patient to come see him or her in two weeks, the patient must leave and call the appointment desk. Usually, there are no available appointments, and the patient is told to call back next month. If the health care providers could schedule their own follow-ups, some aspects of this problem would be prevented.

Although automated access to medical literature ranked fourth overall, five of the seven medical specialties requested it as one of their top three choices. This would be a viable service that could be
offered at a justifiable cost. Therefore, this issue should be addressed further.

**Computer Support by Medical Specialty**

*Hypothesis.* There is no difference in the way support is viewed by different medical specialists.

*Decision.* The hypothesis should be accepted. There are no two medical specialties significantly different at an alpha level of 0.05.

*Rationale.* The rationale is based upon the responses (See Appendix J for database) to questions one, five, six, seven, eight, and nine of the survey (Appendix G). The results were processed through SPSSX. The F ratio of 1.3190 is less than 2.10 at an alpha level of 0.05.

Thus, the null hypothesis should be accepted. (See Appendix L for more detail.)

*Cautions.* The above test was run with two "expert systems" related questions (questions eight and nine of Appendix G). Because expert systems is a very political subject in the health care field, the results could have
been skewed. Consequently, the same test was run without the two "expert systems" questions. Those results follow in the section: Support of Medical Systems without Expert Systems.

The weights assigned to the questions in the survey were equal. For example:

Question one:
A home computer connected to my medical treatment facility would be helpful in my practice.

Question five:
I feel comfortable learning to use a computer.

Both have the same weight. Therefore, when the questions are added together to give a total number for support, each question has the same strength. A better approach would have been to assign higher weights to the questions that were more important as an indicator of support.

The responses from biomedical and allergist were too small (nine and three respectively) to be statistically significant.

The importance of nonsupport must be understood. Medical systems implementation in health care settings may be adversely affected by a nonsupport staff.

Implications. Looking at the results, it appears that all medical specialties should be managed equally.
However, because this test was run with two "expert systems" questions, the results may be skewed. Therefore, selection of the final management approach should be delayed until the following test is run without the "expert systems" questions.

Support by Medical Specialty without Expert Systems

**Hypothesis.** The hypothesis is the same. However, questions eight and nine (Appendix G) were removed from the test.

**Decision.** The hypothesis is rejected. There is a significant difference between nurses and clinicians.

**Rationale.** The rationale is based upon the responses (See Appendix J for database.) to questions one, five, six, and seven of the survey (Appendix G). The results were processed through SPSS\(^x\). The F ratio of 3.8133 is more than 2.10 at an alpha level of 0.05.

Thus, the null hypothesis should be rejected.

Furthermore, SPSS\(^x\) states that there is a significant difference between the nurses and clinicians based upon an average mean of 15.0684.
<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses</td>
<td>14.3309</td>
</tr>
<tr>
<td>Clinicians</td>
<td>16.1311</td>
</tr>
</tbody>
</table>

(See Appendix M for more detail.)

Cautions. As previously stated, the weights assigned to the questions in the survey are equal.

Implications. This test suggests that clinicians support medical computer automation more than nurses. However, before a conclusion can be drawn, one must run a multiple classification analysis—a two way analysis of variance. This will give a better indication if there is a relationship between medical specialty and support. Results to follow later in the section: Support by Medical Specialty Holding Experience.

Support by Military Grade without Expert Systems

Hypothesis. There is no difference in the way support is viewed by different military grades.

Decision. The hypothesis is accepted. That is, there are no two military grades that are significantly different.

Rationale. The rationale is based upon the responses (See Appendix J for database.) to questions one, five, six, and seven of the survey (Appendix G). Because there was a significant difference when testing without "expert systems", questions eight and nine
(Appendix G) were again left off. The results were processed through SPSS$^X$. The $F$ ratio was 0.7541 and the table $F$ value at an alpha level of 0.05 was 2.21.

Therefore, the hypothesis was accepted. (See Appendix N for more detail.) (Note: This same test was run with questions eight and nine of Appendix G added.) Here too, the hypothesis was accepted as noted below:

(See Appendix O for more detail.)

Cautions. Here too, the weights used in developing the value of support are suspect. Groups one and two provided a low number of responses.

<table>
<thead>
<tr>
<th>Group</th>
<th>Group Name</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Second Lieutenants</td>
<td>18</td>
</tr>
<tr>
<td>Two</td>
<td>First Lieutenants</td>
<td>28</td>
</tr>
<tr>
<td>Three</td>
<td>Captain</td>
<td>216</td>
</tr>
<tr>
<td>Four</td>
<td>Major</td>
<td>123</td>
</tr>
<tr>
<td>Five</td>
<td>Lieutenant Colonel</td>
<td>39</td>
</tr>
<tr>
<td>Six</td>
<td>Colonel</td>
<td>44</td>
</tr>
</tbody>
</table>
Therefore, their responses may not be representative.

Implications. The computer support is similar among all military grades. Thus, the people across all grades can be managed with the same mechanisms.

Computer Experience by Specialty

Hypothesis. There is no difference in computer experience among different medical specialists.

Decision. The hypothesis should be rejected. There is a significant difference between nurses and clinicians.

Rationale. The rationale is based upon the response(s) (See Appendix J for database.) to questions two, three, and four of the survey (Appendix G). The results were processed through SPSSX. The F ratio was 3.5507 and the table F value at an alpha level of 0.05 was 2.21.

Therefore, the hypothesis should be rejected. Furthermore, SPSSX states that there is a significant difference between the nurses and clinicians based upon an average mean of 10.4989.
Air Force

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurses</td>
<td>10.0221</td>
</tr>
<tr>
<td>Clinicians</td>
<td>11.2131</td>
</tr>
</tbody>
</table>

(See Appendix P for more detail.)

Cautions. As noted above, the weights assigned to the questions are equal. More specifically, question 2 (Appendix G) concerning exposure to automation within the formal education process may be time biased, and thus, a better understanding of their level of experience may have been missed. The number of responses (three) from the allergists are too limited to give a representative sample.

Implications. This test suggests that clinicians have more medical computer experience than nurses. However, before a conclusion can be drawn, one must run a multiple classification analysis—a two way analysis of variance. Results to follow in section: Support by Medical Specialty Holding Experience.

Computer Experience by Military Grade

Hypothesis. There is no difference in computer experience among different military grades.

Decision. The hypothesis should be accepted. No two grades are significantly different.

Rationale. The rationale is based upon the responses (See Appendix J for database.) to questions
two, three, and four of the survey (Appendix G). The results were processed through SPSSx. The F ratio was 1.9681 and the table F value at an alpha level of 0.05 was 2.21.

Therefore, the hypothesis should be accepted. (See Appendix Q for more detail.)

Cautions. As noted above, the weights assigned to the questions (Appendix G) are equal. Groups one and two provided a low number of responses.

<table>
<thead>
<tr>
<th>Group</th>
<th>Group Name</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Second Lieutenants</td>
<td>18</td>
</tr>
<tr>
<td>Two</td>
<td>First Lieutenants</td>
<td>28</td>
</tr>
<tr>
<td>Three</td>
<td>Captain</td>
<td>216</td>
</tr>
<tr>
<td>Four</td>
<td>Major</td>
<td>123</td>
</tr>
<tr>
<td>Five</td>
<td>Lieutenant Colonel</td>
<td>39</td>
</tr>
<tr>
<td>Six</td>
<td>Colonel</td>
<td>44</td>
</tr>
</tbody>
</table>

Therefore, their responses may not be representative.

Implications. Computer experience is similar among all military grades. Thus, the people across all grades can be managed with the same mechanisms.

Support by Medical Specialty Holding. Experience

Hypothesis. Interaction effects are zero: The mean difference in main effects of support and
experience is the same for all medical specialties.

**Decision.** Medical specialty does not affect support. Rather, it is experience that impacts support.

**Rationale.** The multiple classification analysis shows:

<table>
<thead>
<tr>
<th>Unadjusted Medical Deviation</th>
<th>Adjusted Medical Specialty</th>
<th>Adjusted Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.06</td>
<td>1.06</td>
<td>0.38</td>
</tr>
</tbody>
</table>

A diminishing effect (lower number) suggests that experience is related to support. This suggests that the experience, not medical specialty, drives support. (See Appendix R for more detail.) In addition, the R squared value goes from 0.047 to 0.521. This increase indicates that the addition of the experience variable adds significantly to the results.

In addition, a test was run looking at support by experience while holding medical specialty. Here the R squared increased only slightly from 0.528 to 0.529. This suggests that the medical specialty impacts support very little. Furthermore, no significant changes took place between adjusted for experience and adjusted for military specialty, as noted below.

<table>
<thead>
<tr>
<th>Unadjusted Medical Deviation</th>
<th>Adjusted Medical Specialty</th>
<th>Adjusted Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.73</td>
<td>0.73</td>
<td>0.72</td>
</tr>
</tbody>
</table>

(See Appendix S for more detail.)
Cautions. There is no way that one can prove that either medical specialty or experience causes support to be negative or positive. The only thing that can be inferred is that there is a correlation.

Implications. The results suggest that the reason nurses do not support medical computer systems as much as clinicians is not because they are nurses, but because nurses, as a group, have not had as much computer experience as the clinicians. Therefore, management must provide medical systems related educational opportunities for nurses in order to upgrade their support for computers.

Support by Experience Holding Grade

Hypothesis. Interaction effects are zero: the mean difference in main effects of support and experience is the same for all military grades.

Rationale. There was no need to run this test because there was no significant difference in the tests that looked at support and experience relating to grade.

Summary:

The geographically dispersed medical treatment facilities; the large, transient, beneficiary population; the limited number of certain medical specialists on active duty; and the variety of medical needs due to these factors, make the automated
needs of the Air Force health care providers especially important. This study analyzed these needs and found that the Air Force health care providers find the automation of test results, medical records, and patient scheduling to be most important.

In part, these automated needs are being addressed in the Air Force. Test results are being automated through the Tri-Service Laboratory System, Tri-Service Radiology System, and Computer Assisted Processing of Cardiographs. Unfortunately, only a few medical treatment facilities have received these (as noted in Appendix C). Therefore, test results remain a realistic concern to the majority of health care providers.

Medical records received the second highest request. Unfortunately, medical records will not be automated in the near future; the current technology is such that the cost remains too high. In addition, the nature of health care in the Air Force would require that the automation of medical records support the constant transfer of data to match the continuous rotation of personnel, from assignment to assignment. This added requirement makes the automation of medical records even more costly.

The automation of patient scheduling is the third choice. Here too, some progress has been made. The
Automated Quality of Care Evaluation Support System is being tested to allow for the automation of scheduling. The high number of responses, as cited in this study, supports this initiative.

In addition to these automated needs, this study showed that there was no significant difference in the way computer support is viewed among different military grades or in computer experience among different military grades. When analyzing support of medical computers by medical specialty, however, there was a significant difference between clinicians and nurses. This significant difference appeared again when looking at computer experience by medical specialty. On the surface, it would appear that nurses, because they are nurses, do not support computers. However, after analyzing the data using the multiple classification analysis, it appears that the reason nurses do not support automation as much as clinicians, is not because they are nurses, but rather, because nurses have less computer experience. The correlation, therefore, is between experience and support; raise the experience and support should go up.
References


Appendix A

Military Commands

These are the military commands that make up the Air Force force. The acronyms in brackets are common in the military. Each command was represented in the survey.

Strategic Air Command (SAC)
Military Airlift Command (MAC)
Tactical Air Command (TAC)
Air Training Command (ATC)
Air Force Logistics Command (AFLC)
Air Force Systems Command (AFSC)
Air University (AU)
United States Air Force Academy (USAFA)
Air Force Space Command (AFSPACECOM)
Alaskan Air Command (AAC)
Pacific Air Force (PACAF)
United States Air Force Europe (USAFE)
Appendix B

Specialties

These are the medical specialties found in the Air Force.

aerospace medicine  preventive medicine
occupational medicine  family practice
primary care  pediatrics
pathology  radiology
radiation therapy  neuroradiology
nuclear medicine  diagnostic radiology
surgery  urology
ophthalmology  otorhinolaryngology
anesthesiology  obstetrics/gynecology
physical medicine  psychiatry
internal medicine  oncology
endocrinology  hematology
rheumatology  nephrology
allergy/immunology  cardiology
dermatology  emergency medicine
gastroenterology  medical entomology
aerospace physiology  clinical psychology
clinical social work  alcohol rehabilitation
dietitian  occupational therapy
pharmacy  optometry
podiatry  environmental health
veterinarian
Appendix C

Medical Computer Systems

a. Existing Systems:

(1) Tri-Service Patient Administration (TRIPAD)

Provides patient administrative support to both patients and health care providers. It supports patient movement tracking and casualty reporting for the National Disaster Medical System (NDMS) sites and fixed medical treatment facilities. TRIPAD is being replaced by ACCESS.

(2) Automated Quality of Care Evaluation Support System (ACCESS)

(a) ACCESS is a minicomputer based system designed to support information collection and Quality Assurance decision-making throughout the Department of Defense medical community. ACCESS possesses powerful capabilities in three major functional areas: Quality Assurance (QA), Admission & Disposition (A&D), and Clinical Records (CR).

(b) When Phase I is complete by mid-1986, ACCESS will be in use at all 52 inpatient facilities worldwide. Phase II enhancements and expansions of ACCESS include: Medical Services Accounting (MSA), Ad Hoc Report generator, ICD-9 Workload Reporting, DEERS interface, Embossed Card Print capability, and Data Archive capability. Plans for Phase III include an ACCESS Outpatient Encounter subsystem and a Patient Appointment and Scheduling system (PAS).

(3) Tri-Service Pharmacy System (TRIPHARM)

(a) Supports inpatient and outpatient pharmacy activities including patient medication profiles, drug interaction screening, inventory control, label/list production, and management reports.

(b) TRIPHARM is currently installed at:

1. USAF Regional Hospital Carswell
2. Malcolm Grow USAF Medical Center
3. USAF Medical Center Keesler
4. Wilford Hall USAF Medical Center
5. USAF Hospital Fairchild
6. School of Health Care Sciences
7. USAF Regional Hospital March
8. USAF Regional Hospital Shaw

Satellite locations at:

1. David Grant USAF Medical Center
2. USAF Clinic Wiesbaden
3. USAF Clinic甜甜圈: 
4. USAF Regional Hospital Langley
5. USAF Clinic Hickam
6. USAF Clinic Wheeler
7. USAF Clinic McGuire
8. USAF Hospital Charleston

(4) Tri-Service Laboratory System (TRILAB)

(a) Supports laboratory operations and management through order/entry results reporting, parameter checking of results, historical result files with comparisons over time, draw list production, laboratory instrument interfaces, procedure/workload accumulation and reporting.

(b) Installed at:
1. USAF Medical Center Wright-Patterson
2. Malcolm Grow USAF Medical Center
3. USAF Regional Hospital Sheppard
4. USAF Medical Center Scott

(5) Tri-Service Radiology System (TRIRAD)

(a) Automates patient scheduling, film tracking/management, procedure result reports, and management reports.

(b) Installed at:
1. David Grant USAF Medical Center
2. USAF Medical Center Scott
3. USAF Regional Hospital March
4. Malcolm Grow USAF Medical Center
5. Wilford Hall USAF Medical Center

(6) Computer Assisted Processing of Cardiograms (CAPOC)

(a) Provides computerized interpretation, transmission, storage, and retrieval of electrocardiograms on a regional basis. Improves the access of cardiologists to smaller MTFs through ECG overreading.

(b) Installed at: all CONUS MTF's and Hawaii

(c) Projected for: Alaskan Air Command MTF's

(7) Automated Cardiac Catheterization Laboratory System (ACCLS)

(a) Automatically digitalizes analog catheterization data providing physiologic measurements and computations.

(b) Installed at:
1. USAF Medical Center Keesler
2. USAF School of Aerospace Medicine
3. USAF Medical Center Wright-Patterson
4. Wilford Hall USAF Medical Center

(8) Defense Eligibility/Enrollment Reporting System (DEERS)
(a) To ensure that our limited resources are applied only to eligible beneficiaries. It is a DoD-wide system. A centralized database of demographic data on personnel eligible for health care.

(b) Installed: worldwide - CONUS is complete.

(9) Medical Expense Performance Module (MEPM) [combines Uniform Chart of Accounts/Automated Source Data Collection (OC/AASDC)]

(a) Records, accumulates, and reports information regarding the expenses incurred and workload performed in military medical and dental treatment facilities using a step-down cost allocation methodology. MEPM will support the data collection from laboratory, pharmacy, radiology, and the resource management office.

(b) Centralized processing at MAJCOMS.

(c) DoD directed worldwide.

(10) Automated Patient Evacuation System (APES)

(a) Will automate the flow of information concerning the movement of patient via the aeromedical evacuation system.

(b) An interim capability using Z-100 microcomputers will be used until system implementation is scheduled.

(11) Medical Readiness Assemblage Material System (MEDRAMS) and Medical Material Management System-On Line (MMMS-OL)

(a) MEDRAMS was developed to provide responsive, dedicated, automated logistics support for prepositioned WRM assemblages.

(b) MMMS-OL is a comprehensive logistics system that will replace the existing batch processed Medical Material Management System (MMMS). MMMS-OL is similar to MEDRAMS utilizing approximately 90% of the MEDRAMS software. Current plans are for MMMS-OL to either evolve into the Composite Health Care System-Logistics (CHCS-LOG) or serve as an Air Force interim system until a separate CHCS-LOG system is developed.

(12) Dental Data System (DDS)

(a) Replaces the card based Dental Service Report. Interfaces to Base Level Personnel System to support the Periodic Dental Examination Program and to the base level Phase II or Phase IV systems for upward reporting. Includes enhancements to provide local management information. The system runs on currently installed DataPoint hardware.

(b) DDS installation is scheduled for completion by Oct 86.

(13) Coronary Artery Risk Evaluation (CARE)

(a) Provides risk potential indicator for developing coronary artery disease, creates a centralized database for trend analysis and research, and manages medical intervention scheduling.

(b) Centralized ADP support currently on Air Force Human
Resources Laboratory hardware with AFOMS/SGSI system development and maintenance.

(14) Medical Administrative Management System (MAMS)
   (a) Command Headquarters system supporting biostatistical database and inpatient diagnostic database. Used to satisfy DoD reporting requirements and as the historical data file for facility, manpower and financial planning.
   (b) MAMS provides a good centralized inpatient overview of clinical diagnosis and treatment. ACCESS will provide replacement for the inpatient piece of this system.

(15) Base Dental Service Report (DSR)
   (a) Supports Air Force requirements for workload reporting and periodic dental examination program.
   (b) DOS system efforts will replace this system.

(16) Defense Medical Regulatory Information System (DMRIS)
   (a) Designed to support patient regulating functions, patient evacuation process, and patient movement.
   (b) APES is tasked to support medical air evacuation operations, while DMRIS is designed to support the regulating function.
   (c) DMRIS linkages have been expanded to a total of 27 CONUS MTFs. Future plans will include linking all CONUS hospitals. Coordination is also being accomplished with other medical automated systems under development.

(17) Real Time Automated Personnel Identification System (RAPIDS)
   (a) RAPIDS was established to streamline the process of ID card issuance and to improve the timeliness of information into the database.
   (b) RAPIDS will provide a user friendly worldwide network of microcomputers linked real time through telecommunications to the DEERS database.

(18) Defense Medical Information System (DMIS)
   (a) The Defense Medical Information System (DMIS) provides management information and information services to the Office of the Assistant Secretary of Defense (Health Affairs) and its field activities, the military medical departments, and other authorized agencies. It is the most comprehensive repository of information on the overall Defense health system. Its data describe the system in terms of its beneficiary populations, facilities, direct-care costs and workloads, the provision of care through civilian sources under the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), and other aspects of the delivery of health care services.
(b) Sources of EMIS data are:
- UCA
- Biometrics offices of the Services
- Health Facilities Planning Offices of the Services
- Personnel offices of the Services
- DEERS
- OCHAMPUS
- Other systems

b. Planned Systems

(1) Composite Health Care System (CHCS)

(a) The CHCS is a planned integrated medical information system to provide comprehensive clinical and administrative support to DoD health care facilities. Goals for the system include: improving the quality of patient care, increasing the efficiency of operations, increasing the accuracy and availability of information, and providing standardized and flexible automation support. The CHCS will support functions in numerous administrative, patient care, and ancillary work centers of the MTF and communicate information among departments.

(b) The TRIMIS Program Office has developed a master plan for system design/specification and acquisition. TRIMIS has taken significant measures to ensure that the delivered system contains all of the technical and functional capabilities required by the users. The contractor will install CHCS functional modules consisting of patient administration, patient appointment and scheduling, laboratory, radiology, pharmacy, nursing support, and clinical dietetics in three phases. The phasing is designed to assist in the orderly progression from departmental functions to a full facility wide system providing urgently needed capabilities as soon as possible.

(c) The CHCS acquisition strategy includes: a single contract award competition, prioritized and phased requirements, and planned installation at USAF Regional Hospital Sheppard as the Air Force prototype site by October 1987.

(2) Tri-Service Food Service System (TRIFOOD)

(a) Will provide menu planning, production planning, purchasing, inventory control, and reference data maintenance.

(b) The system is scheduled for 37 of our most active inpatient facilities.

(3) Tri-Service Logistics System (TRILOG)

(a) This system will consist of the Central Processing and Distribution module (CPD). It will support 14 facilities designated to use a CPD function.

(b) The CHCS-LOG, a comprehensive logistics system, will incorporate the CPD system.

(4) Medical Readiness Automated Data Working Group (MEDRAD)
(a) This group was formed based on the perceived need for data automation support in combat casualty system.

(b) MEDRAD working group was established by HQ AFOMS, Medical Wartime Hospital Integration Office on 9 April 1985.

(c) Following Baseline Requirements Documents completion, a comparison can be made with other automated systems - TAMMIS and AQCESS.

(d) Although MEDRAD is not a system per se, the work of this group is expected to result in either a new system or modification of an existing system to support contingency operations.

(5) Computerized Occupational Health Program (COHP)

(a) COHP supports the requirements of the Occupational Safety and Health Act of 1970. It must provide a means of scheduling inspections, maintaining shop and individual records, reporting exposures and epidemiological studies.

(b) Implementation: AF-wide FY 87-89
Appendix D

Position Paper

on

Automation Concerns Relating to:
Needs, Experience, and Support

The Air Force's diversified and unique health care needs are being met in part with automation. Unfortunately, many of the automated systems have been developed through a top down approach. Consequently, it appears that health care providers' medical computer needs, computer experience baseline, and support for automation have not been addressed from the user's level. Furthermore, it appears that the current medical computer systems do not meet the users' needs or are too complicated for them to use without extensive training. This is evidenced by talking with users in the field or observing the limited use of many computers. This lack of support makes it difficult to manage existing medical computer systems and to plan and implement future medical computer systems.

A March 1987 survey (Atch\textsuperscript{1}) was sent to ten percent of our health care providers at 28 medical treatment facilities. The survey showed that medical test results and patient scheduling should be automated at each medical treatment facility. Of the 16 preferences for automation support surveyed, test results and patient scheduling received the highest and third highest weighted scores, 520 and 290 respectively. The second highest weighted

\textsuperscript{1}Captain Perry's study is the attached and source documentation.
score, 346, was for the automation of medical records. However, the current technology makes the automation of medical records cost prohibitive at this time.

Secondly, the survey revealed that of all the medical specialties surveyed, members of the nurse corps have the least amount of computer experience. The analysis (Atch., Appendix P) showed that the mean score between nurses and clinicians is 10.02 and 11.21 respectively. This is significantly different when based upon an average mean of 10.49. Thus, the nursing corps needs to be given more opportunity to understand how and what medical computers can do for them.

Although there is a significant difference between computer experience and medical specialty (i.e. nurses and clinicians), there is no significant difference between computer experience and military grades. Therefore, grades should not be a factor when managing computers.

Thirdly, the survey shows that support is a product of experience and that to increase support we should increase experience. The analysis (Atch., Appendix R) showed that when experience was added to support and adjusted for independents and covariates it changed from 1.06 to 0.38 for clinicians and from -0.74 to -0.28 for nurses. Furthermore, the R squared value rose from 0.047 to 0.521. These indicate that support is positively correlated to experience.
My recommendations based upon these findings are as follows: First, test results and patient scheduling should be automated at all treatment facilities either with the Automated Quality of Care Evaluation Support System or other Tri-Service Medical Information Systems (Atch., Appendix C). Secondly, education and awareness programs should be developed to increase computer knowledge for all personnel within all military grades to improve the support for and use of facility based automation systems.
Appendix E

Bases in Survey

a) SAC:

Beale Air Force Base, California
Minot Air Force Base, North Dakota
Carswell Air Force Base, Texas

b) MAC:

Dover Air Force Base, Delaware
Travis Air Force Base, California
Scott Air Force Base, Illinois

c) TAC:

Charleston Air Force Base, South Carolina
Homestead Air Force Base, Florida
Myrtle Beach Air Force Base, South Carolina

d) ATC:

Chanute Air Force Base, Illinois
Sheppard Air Force Base, Texas
Cannon Air Force Base, New Mexico

e) AFLC:

Wright-Patterson Air Force Base, Ohio
Kelly Air Force Base, Texas
Tinker Air Force Base, Oklahoma

f) AFSC:

Edwards Air Force Base, California
Eglin Air Force Base, Florida
Hanscom Air Force Base, Massachusetts

g) AU:

Maxwell Air Force Base, Alabama

h) AAC:

Elmendorf Air Force Base, Alaska
i) USAFA:
   United States Air Force Academy, Colorado

j) AFSPACECOM
   Peterson Air Force Base, Colorado

k) PACAF:
   Yokota Air Base, Japan
   Osan Air Base, Korea
   Misawa Air Base, Japan

L) USAFE:
   Sembach Air Base, Germany
   Incirlik Installation, Turkey
   San Vito Dei Normanni Air Station, Italy
Appendix F

Consultants

These are the medical specialties that were involved with the pilot study.

Colonel (MD) Royden W. Marsh Psych/Neuro.
Colonel (MD) William J. Myers Internal Medicine
Colonel (MD) Val Hemming Pediatrics
Colonel (MD) Vernon W. Armbrustmacher Pathology
Colonel (MD) Albert S. Hale Neuroradiology
Colonel (MD) Gary Eglinton OB/GYN
Colonel (MD) Robert J. Ursano Psychiatry
Colonel (Nurse) Patricia L. Williams Nursing Affairs
Lt. Colonel (MD) David C. Schutt Family Practice
Lt. Colonel (MD) Raymond Ten Eyck Military Medicine
HEALTH CARE PROVIDERS' COMPUTER NEEDS

The geographically dispersed medical treatment facilities and the variety of medical needs at each of those facilities, make the computer needs of the Air Force health care provider (physicians, nurses, and physician assistants) especially unique. In order to meet these needs, a better understanding of your views and opinions is required. This survey should be used to express your views and opinions; additional comments are welcome. Any questions concerning this survey should be directed to Captain Michael Perry, SGSIW, Autovon 297-1862.

This survey is covered by the Privacy Act. You will remain anonymous and your comments confidential. Although your participation is voluntary, your support will help insure that your computer needs are considered.

This survey is designed to take no more than five minutes. Answer all the questions in the order in which they appear.

Thank you for your time.

Direction for questions one through nine: place a mark next to the answer that best describes your feelings in response to the statement. (Mark only one choice for each question.)

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<th>Question</th>
<th>Description</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<td>1.</td>
<td>A computer at my home that is connected to my medical treatment facility would be helpful in my practice.</td>
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<td>2.</td>
<td>My formal education incorporated the use of computers as part of the curriculum.</td>
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<td>Occasionally</td>
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<td>Always</td>
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<td>3.</td>
<td>In my medical or nursing practice, I use computers routinely.</td>
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4. In other areas such as at home, in banks, etc., I have found computers to be a valuable tool.

Strongly Disagree Disagree Neutral Agree Strongly
( ) ( ) ( ) ( )

5. I feel comfortable learning to use a computer.

Strongly Disagree Disagree Neutral Agree Strongly
( ) ( ) ( ) ( )

6. In my everyday life, I find computers to cause more problems than they are worth.

Strongly Disagree Disagree Neutral Agree Strongly
( ) ( ) ( ) ( )

7. Computers can help improve my practice.

Strongly Disagree Disagree Neutral Agree Strongly
( ) ( ) ( ) ( )

8. I would consider a medical expert system (a computer that makes educated guesses as to which is the best medical course to follow based upon "rules of thumb" obtained from the medical experts that it emulates) helpful in making a medical diagnosis.

Strongly Disagree Disagree Neutral Agree Strongly
( ) ( ) ( ) ( )

9. I would consider a medical expert system helpful in verifying a medical diagnosis.

Strongly Disagree Disagree Neutral Agree Strongly
( ) ( ) ( ) ( )
Direction for question 10 is as follows: Review the functions listed below. Write the number "1" next to the function that you believe a computer system would make easier or more productive, place the number "2" next to your second choice, and finally the number "3" next to your last choice. (Make only three selections.)

10. ( ) Cases Done Listing
   ( ) Clinical Management Tool (e.g. Titurete)
   ( ) Research
   ( ) Continuing Medical Education Records
   ( ) Quality Assurance
   ( ) Medical Records
   ( ) Recovery Listing
   ( ) Patient Medications
   ( ) Test Results
   ( ) Medical Literature
   ( ) Patient Scheduling/Follow-up Appointments
   ( ) Military / Personal Appointments
   ( ) Differential Diagnostic Trees
   ( ) Medical Expert Systems To Verify Diagnoses
   ( ) Medical Expert Systems To Remind Of Rare Or Peculiar Diseases and Treatment
   ( ) Other: ________________________________

11. My grade is: 0-_____ 13. My AFSC is: ________.
12. My primary specialty is: _________________________.

Again, thank you for your time.
Appendix H

Letter to Air Force Manpower and Personnel Center

SGSIV

Medical Providers' Automation Survey Approval Request

HQ AFWPN RRXOS
Randolph AFB TX 78150-6001

For my telephone conversation with Lt. Colonel Gorman, I am submitting a survey for your review and approval. IAW AFR 30-60, the information requested for your approval is as follows:


b. The geographically dispersed medical treatment facilities and the potential for a variety of medical needs at any and all of these medical treatment facilities, make the computer needs of the health care providers especially unique. No study has been conducted in the Air Force to ascertain the exact nature of these needs. Through this assessment, one should be able to gain a better understanding of providers' computer experience, computer needs as they see them, and support or nonsupport for computer usage. This understanding would help in the planning phase of computer development. This survey is being developed and administered under a time critical condition due mainly because I am an AFIT student in a residency program, and if I cannot complete this study in time, I will be PCSed prior to getting my masters. In addition, no one would be assigned to complete this needed study. Consequently, it would be helpful if you could process this expeditiously.

c. Oppenheim's Questionnaire Design and Attitude Measurement and Stone's Research Methods in Organizational Behavior were used as a guide in developing the pilot interview and final survey. In so doing, physicians from many specialties were consulted. The attached final survey was completed IAW AFR 12-35 and cites that the survey is covered by the Privacy Act and is voluntary in nature.

d. The null hypotheses would center around provider's specialty and medical specialty not impacting their needs, experience, and support of medical computer automation.

e. There are around 6,000 medical providers that make up the population.
f. The size of the sample selected will be dictated by the method of selection whereby all medical providers at one large hospital, one medium (or small) hospital, and one clinic within each major command will be questioned. This equates to a sample size of approximately 600 or 10% of the population.

g. The survey will be signed by Brigadier General DeHart (SGP) and sent to the hospital commander at each of the selected medical treatment facilities. All medical providers within the facility will be requested to complete the survey and return it to their resource manager who, in turn, will forward it to AFOMS/SGSIW for tabulation and analysis.

h. The statistical analyses will center around the Likert scale and the Pearson Correlation Coefficient test. A standard statistical software package will be used to tabulate the results.

i. The results will be included in a feasibility study and submitted to Headquarters Air Force Office of Medical Support and Defense Medical System Support Center. AFR 12-30 has been reviewed and it has been determined, as outlined in Paragraph 10b through 10i, that the survey does NOT fall under the For Official Use Only requirements.

2. I am the project officer for this survey and can be contacted at autovon 297-1862. My office symbol is: AFOMS/SGSIW.

MICHAEL L. PERRY, Capt, USAF, MSC  
Medical Systems Officer  

Atch: Survey
Appendix I

Staff Summary Sheet
### Summary

1. (U) The proliferation of computers into our health care system continues, at an increasing rate. Unfortunately, our health care providers have been given little opportunity to state what functions they would like to see automated.

2. (U) In order for our health care providers' views to be better known, I have developed a survey in conjunction with SGPC and SGHA (Lt Col Quintana and Dr. Opsut). HQ AFMPC/DPMYOS approval was required and included in Tab 3. The survey will be sent to the 28 MTFs (Tab 4) chosen through a stratified, random sampling process.

3. (U) The confidential views of our health care providers' will be consolidated and analyzed and then used for planning future medical computer systems.

### Recommendation

4. (U) That HQ USAF/SGP sign the endorsement letter (Tab 1) and the MAJCOM information letter (Tab 2).

---

**Subject:** Health Care Providers' Computer Needs  
**Date:**

**Summary:**

1. The proliferation of computers into our health care system continues, at an increasing rate. Unfortunately, our health care providers have been given little opportunity to state what functions they would like to see automated.

2. In order for our health care providers' views to be better known, I have developed a survey in conjunction with SGPC and SGHA (Lt Col Quintana and Dr. Opsut). HQ AFMPC/DPMYOS approval was required and included in Tab 3. The survey will be sent to the 28 MTFs (Tab 4) chosen through a stratified, random sampling process.

3. The confidential views of our health care providers' will be consolidated and analyzed and then used for planning future medical computer systems.

**Recommendation:**

4. That HQ USAF/SGP sign the endorsement letter (Tab 1) and the MAJCOM information letter (Tab 2).
Computer Needs of Health Care Providers

TO: See Distribution List

1. The proliferation of computers into our health care system continues, often times without our health care providers being given the opportunity for stating what functions they would like to see automated. In an attempt to change this, I am asking that you have your health care providers fill out the attached survey. Their confidential views will be consolidated and analyzed and then used for planning future medical computer systems.

2. Because of the tremendous impact of computers in medicine, I would like to see full participation by your health care providers. Input from all specialities and levels of experience is essential to insure valid results. The survey's should be returned NLT 1987 to:

   Captain Michael L. Perry
   SGSIW
   Bolling ABF
   Washington, DC 20332-6188
   Autovon: 297-1862

3. Questions concerning this survey should be directed to Captain Perry.

RUFUS M. DeHART, BrigGen, USAF, MC
Director, Professional Affairs
and Quality Assurance
Office of the Surgeon General
REPLY TO:

SGSIW

SUBJECT:

Computer Needs of Health Care Providers

TO:

ALMAJCOMS/SG

1. The proliferation of computers into our health care system continues, often times without our health care providers giving input as to what functions they would like to see automated. In an attempt to change this, we have sent a survey to a randomly selected group of MTFs, some of which are within your command. (See atch.) Their views will be consolidated and analyzed and then used for planning future medical computer systems.

2. The survey has been approved by HQ AFMPC/DPMYOS. Any question concerning the survey should be directed to:

   Captain Michael L. Perry
   SGSIW
   Bolling AFB
   Washington, DC 20332-6188
   Autovon: 297-1862

3. Thank you for your support.

RUFUS M. DeHART, BrigGen, USAF, MC
Director, Professional Affairs and Quality Assurance
Office of the Surgeon General
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4 3 4 4 5 4 4 3 4 3 9386 08 09 11
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4 3 4 5 5 4 4 2 2 4 9376 11 09 10
5 4 4 5 5 5 5 5 3 9586 06 10 08
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5 5 5 5 5 5 5 3 3 4 9406 09 10 11
5 3 3 5 5 5 4 4 4 4 9416 10 04 13
5 2 4 4 4 4 4 4 4 4 9416
3 1 3 4 5 4 4 3 4 3 9326 09 08 10
2 1 4 3 4 4 4 3 4 3 9356 06 08 09
4 4 2 4 5 5 3 4 4 4 9356 01 03 14
5 3 4 4 4 4 5 2 3 3 9286 06 03 09
3 3 4 3 3 3 4 3 3 3 9381 09 11 08
5 1 4 5 5 5 4 3 4 3 9586 03 09 10
5 1 4 5 5 5 5 4 4 6 9586 06 14 10
4 3 4 4 4 4 4 3 2 3 9411 15 11 01
2 2 5 2 4 4 3 1 1 3 9356 10 06 08
2 1 2 3 4 4 4 2 2 4 9346
5 4 5 4 5 5 5 4 3 3 9366 09 10 15
5 3 5 5 5 5 5 4 3 4 9366 06 03 11
4 2 4 5 5 5 5 5 1 9726 16 14 08
3 3 2 4 4 4 3 3 3 1 9751 06 09 02
3 1 3 5 5 5 4 3 3 3 9756 04 03 14
3 1 1 3 3 3 3 3 3 2 9756
2 1 2 4 4 4 4 4 4 4 9756 10 06 05
3 1 2 3 3 3 3 3 3 2 9756 04 12 05
5 4 5 5 5 5 5 4 4 2 9756 06 09 14
5 1 4 5 5 5 5 2 4 3 9756 16 08 09
2 1 2 5 5 5 5 3 3 2 9756 06 03 05
2 1 2 4 3 3 3 3 3 2 9756 09 04 05
4 3 2 5 5 5 4 3 4 2 9756 09 05 04
3 1 1 3 4 4 4 4 4 4 9756 05 03 12
5 4 1 5 5 3 4 3 3 9756 03 08 16
4 1 2 5 5 5 5 5 5 4 9756 09 08 05
4 2 1 5 5 4 4 3 4 1 9751 11 09 06
2 2 2 3 4 4 4 4 4 1 9756 06 08 10
3 4 4 5 5 5 5 5 5 3 9756 05 06 09
3 2 3 4 4 4 4 4 4 1 9756 09 02 08
2 1 2 5 4 5 4 3 4 3 9756 06 08 05
2 3 2 3 5 5 4 3 4 1 9756 09 05 08
4 2 2 4 5 5 4 4 4 3 9756 06 09 08
1 2 2 5 4 5 4 3 4 3 9756 06 05 09
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1 4 2 5 5 5 5 4 5 3 9756 09 05 14
2 3 4 4 5 4 4 3 3 3 9286 06 09 05
2 1 2 5 4 4 4 4 4 5 9326 06 09 14
1 1 1 5 5 4 5 4 4 3 9756 11 08 09
2 1 4 3 4 4 3 3 3 3 9286 11 09 08
3 1 5 5 5 5 5 5 5 5 9756 09 11 12
3 1 1 5 5 5 5 5 5 5 9756 06 09 11
Appendix K

Requested Medical Systems

Column 1 is level of need. (For example, 9 is test results.)
Column 2 is the biomedical medical specialty (91).
Column 3 is the 92 medical specialty.
Column 4 is the 93 medical specialty.
Column 5 is the surgeon medical specialty (94).
Column 6 is the clinicians medical specialty (95).
Column 7 is the allergists medical specialty (96).
Column 8 is the nurses medical specialty (97).

Appendix K-2 is sorted by all health care providers.
Appendix K-3 is sorted by 91s.
Appendix K-4 is sorted by 92s.
Appendix K-5 is sorted by 93s.
Appendix K-6 is sorted by 94s.
Appendix K-7 is sorted by 95s.
Appendix K-8 is sorted by 96s.
Appendix K-9 is sorted by 97s.
Appendix L

Support by Medical Specialty with Expert Systems
**ONE WAY**

**VARIABLE**
- SUPPORT
- SUPPORT FOR COMPUTERS AND EXPERT SYSTEMS
- BASIC SKILL

**ANALYSIS OF VARIANCE**

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<th>SOURCE</th>
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<th>SUM OF SQUARES</th>
<th>MEAN SQUARES</th>
<th>F</th>
<th>PROB.</th>
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<td>BETWEEN GROUPS</td>
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<td>21.6660</td>
<td>1.6100</td>
<td>.2470</td>
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<td>THIN GROUPS</td>
<td>459</td>
<td>7498.7805</td>
<td>16.3372</td>
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<td></td>
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<tr>
<td>AGE</td>
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<td>7682.0387</td>
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<tr>
<th>UP</th>
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<th>MEAN</th>
<th>STANDARD DEVIATION</th>
<th>STANDARD ERROR</th>
<th>MINIMUM</th>
<th>MAXIMUM</th>
<th>95% CONF. INTERVAL FOR MEAN</th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>9</td>
<td>21.5869</td>
<td>5.8190</td>
<td>1.9397</td>
<td>8.0000</td>
<td>29.0000</td>
<td>17.4120 to 26.8518</td>
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<tr>
<td>RC0</td>
<td>61</td>
<td>21.5016</td>
<td>3.7030</td>
<td>1.1849</td>
<td>14.0000</td>
<td>29.0000</td>
<td>20.8517 to 22.8616</td>
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<tr>
<td>FFS F</td>
<td>146</td>
<td>22.0857</td>
<td>4.2384</td>
<td>1.3519</td>
<td>10.0000</td>
<td>30.0000</td>
<td>21.3181 to 22.7035</td>
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<tr>
<td>FFS F</td>
<td>52</td>
<td>22.1731</td>
<td>4.4401</td>
<td>1.3657</td>
<td>10.0000</td>
<td>30.0000</td>
<td>20.8389 to 23.4062</td>
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<tr>
<td>LEGIS</td>
<td>61</td>
<td>23.5889</td>
<td>3.7689</td>
<td>1.1858</td>
<td>21.0000</td>
<td>30.0000</td>
<td>20.6318 to 23.0766</td>
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<tr>
<td>SE</td>
<td>124</td>
<td>21.5821</td>
<td>3.4086</td>
<td>1.0875</td>
<td>15.0000</td>
<td>29.0000</td>
<td>21.0002 to 22.1640</td>
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<tr>
<td>DAL</td>
<td>455</td>
<td>22.0644</td>
<td>4.0552</td>
<td>1.2176</td>
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<td>30.0000</td>
<td>21.6587 to 22.4331</td>
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</table>
TIELE RANCE TEST

3  PROCEDURE

5.04  5.04  5.04  5.04  5.04

RANGES ABOVE ARE TIELE RANGES.
E VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS .

1.8661 * RANGE / DEQRT(1/N(I) + 1/N(J))

TWO GROUPS ARE SIGNIFICANTLY DIFFERENT AT THE 0.050 LEVEL.

APR 67  HEALTH CARE PROVIDERS COMPUTER NEEDS
:42:25  SUPPORT BY SPECIALTY w ES

READING TASK REQUIRED 4.31 SECONDS CPU TIME; 6.00 SECONDS ElAPSED.

100 COMMAND LINES READ.
0 ERRORS DETECTED.
0 WARNINGS ISSUED.
6 SECONDS CPU TIME.
10 SECONDS ELAPSED TIME.
END OF JOB.

L  05
JOIN-RALE
3: /SHUTLE/ AND UNKNOWN
9X
QUIT

01.JOUT, TX (.2.16)
3: /SHUTLE/
TITLE 'Support by specialty w ES'
LE "Health Care Providers Computer Needs"
HANDLE RESPONSE NAME = 'SOURCE/RESPONSE'
3
TITLE 'Support by specialty wo ES'
LE "Health Care Providers Computer Needs"
TITLE 'Support by specialty wo ES'
HANDLE RESPONSE NAME = 'SOURCE/RESPONSE'
NOW:
VARIABLE A' = A'SCSE (91.97)/

THE

3 = 'SOURCE ATTACH (91.97)/

"
Appendix M

Support by Medical Specialty without Expert Systems
162 WORDS OF MEMORY REQUIRED FOR ONEWAY PROCEDURE.

54 WORDS OF MEMORY AVAILABLE.

LARGEST CONTINUOUS AREA HAS 74503 WORDS.

-------------------------- ONE WAY --------------------------

VARIABLE SUPPORT SUPPORT FOR COMPUTERS NO EXPERT SSS
BY VARIABLE ASCENDING BASIC SKILL

ANALYSIS OF VARIANCE

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<th>SOURCE</th>
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<th>MEAN SQUARES</th>
<th>F</th>
<th>F PROB.</th>
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<td>TOTAL</td>
<td>457</td>
<td>4400.7877</td>
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IF COUNT MEAN STANDARD DEVIATION STANDARD ERROR MINIMUM MAXIMUM 95% CONF INT FOR MEAN

7 9 14.6037 3.8021 1.0317 6.0000 19.0000 11.6949 TO 17.8884
F 61 14.6037 2.7342 .2801 9.0000 19.0000 13.9033 TO 15.3088
C FS F 148 15.1959 3.1586 .2580 5.0000 20.0000 14.9893 TO 15.7166
AGE 52 15.6694 2.9303 .2408 8.0000 20.0000 15.0507 TO 16.8501
INCREASE 61 16.1311 3.4073 .4287 6.0000 20.0000 15.2855 TO 17.0398
LEGIS 3 17.3333 2.3333 1.3333 16.0000 20.0000 11.3334 TO 23.0703
SEX 126 14.3333 2.7757 .3980 8.0000 20.0000 13.6003 TO 14.8016
D ALL 468 15.0884 3.0708 .1419 5.0000 20.0000 14.7894 TO 15.3873
VARIABLE SUPPORT SUPPORT FOR COMPUTERS WO EXPERT SSS
BY VARIABLE ABSTRACT BASIC SKILL

MULTIPLE RANGE TEST

HEF: RODRIL
VALUES FOR THE 0.050 LEVEL -

5.01 5.01 5.01 5.01 5.01

RANGES ABOVE ARE TABLE RANGES.
R VALUES ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS...

\begin{equation}
2.1332 \times RANGE \times \sqrt{\frac{1}{n(i)} + \frac{1}{n(j)}}
\end{equation}

(*) DENOTES PAIRS OF GROUPS SIGNIFICANTLY DIFFERENT AT THE 0.050 LEVEL

\begin{tabular}{ll}
NPBMSC & NURSE \\
UAEBULL & PA KID O \\
RODRIL & MD \\
SPGNE & MED FS F \\
EOFEIR & SURGONS \\
DSOCG & CLINICIA \\
NII & ALLERGS \\
\end{tabular}

MEAN GROUP O FSAS

14.3339 NURSE
14.5666 PA KID O
14.6667 MD
15.1995 MED FS F
16.794 SURGONS
17.3333 CLINICIA

APR 87 HEALTH CARE PROVIDERS COMPUTER NEEDS
PAGE 30-43 SUPPORT BY SPECIALTY WO ES

EXECUTION TASK REQUIRED 4.34 SECONDS CPU TIME; 5.47 SECONDS ELAPSED.

100 COMMAND LINES READ.
0 ERRORS DETECTED.
0 WARNINGS ISSUED.
6 SECONDS CPU TIME.
9 SECONDS ELAPSED TIME.
END OF JOB.

OF 06
\text{Julian?}
Appendix N

Support by Military Grade without Expert Systems
FILE "HEALTH CARE PROVIDERS COMPUTER NEEDS"
SUBTITLE 'SUPPORT BY GRADE WO ES'
FILE HANDLE RESPONSE NAME 'SCORE/RESPONSE'
SET PRINTBACK=NO

140 WORDS OF MEMORY REQUIRED FOR ONE WAY PROCEDURE.

WE ARE 7425 WORDS OF MEMORY AVAILABLE.
LARGEST CONTIGUOUS AREA HAS 7425 WORDS.

-----------------------------
VARMAKE GWE air KR fld EP WM
-------------------------------

--- ONE WAY ---

VARIABLE SUPPORT SUPPORT FOR COMPUTERS WO EXPERT SYS
EX VARIABLE GRADE MILITARY GRADE

ANALYSIS OF VARIANCE

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<td>9.5211</td>
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<th>STANDARD ERROR</th>
<th>STANDARD DEVIATION</th>
<th>MINIMUM</th>
<th>MAXIMUM</th>
<th>95% CONF INT FOR MEAN</th>
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<td>19.0000</td>
<td>13.3102 TO 15.5787</td>
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<td>.2105</td>
<td>3.0305</td>
<td>5.0000</td>
<td>20.0000</td>
<td>14.6314 TO 15.4612</td>
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<tr>
<td>? 4</td>
<td>123</td>
<td>15.2327</td>
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<td>15.1111</td>
<td>.4738</td>
<td>3.1792</td>
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<td>20.0000</td>
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<td>20.0000</td>
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--- ONE WAY ---
TILE RANGE TEST

DEF ROEDURE
VALUES FOR THE 0.050 LEVEL:

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<th>Value</th>
<th>Value</th>
<th>Value</th>
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</table>

2 RANGES ABOVE ARE TRIPLE RANGES.
E VALUE ACTUALLY COMPARED WITH MEAN(J) - MEAN(I) IS:

\[ E = 2.1619 * \text{RANGE} * \text{DEGAND}(1/N(I) + 1/N(J)) \]

TWO GROUPS ARE SIGNIFICANTLY DIFFERENT AT THE 0.050 LEVEL.

APR 87 HEALTH CARE PROVIDERS COMPUTER NEEDS
:57:57 SUPPORT BY GRADE NO 15

RUNNING TASK REQUIRED 4.30 SECONDS CPU TIME; 5.46 SECONDS ELAPSED.

100 COMMAND LINES READ.
0 ERRORS DETECTED.
0 WARNINGS ISSUED.
6 SECONDS CPU TIME.
9 SECONDS ELAPSED TIME.
END OF JOB.

G .S
INION?-
Appendix O

Support by Military Grade with Expert Systems
### OneWay

**VARIABLE EDITOR**

SUPPORT FOR COMPUTERS AND EXPERT SYSTEMS

BY VARIABLE GRADE MILITARY GRADE

**ANALYSIS OF VARIANCE**

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<th>F (R discordant prob.)</th>
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**Hierarchical Count**

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<th>MAXIMUM</th>
<th>95 PERCENT CONF. INTERVAL FOR MEAN</th>
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<td>17.0000</td>
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<td>19.8851 TO 23.0749</td>
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<td>.0941</td>
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<td>.3315</td>
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<td>29.0000</td>
<td>21.2510 TO 23.7745</td>
</tr>
<tr>
<td>P 6</td>
<td>44</td>
<td>22.6394</td>
<td>.0287</td>
<td>.6372</td>
<td>11.0000</td>
<td>30.0000</td>
<td>21.3512 TO 23.9214</td>
</tr>
</tbody>
</table>

**IAL**

<table>
<thead>
<tr>
<th>COUNT</th>
<th>MEAN</th>
<th>STANDARD DEVIATION</th>
<th>STANDARD ERROR</th>
<th>MINIMUM</th>
<th>MAXIMUM</th>
<th>95 PERCENT CONF. INTERVAL FOR MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>497</td>
<td>22.0490</td>
<td>.0330</td>
<td>.1576</td>
<td>8.0000</td>
<td>30.0000</td>
<td>21.6762 TO 22.4138</td>
</tr>
</tbody>
</table>
LITTLE RANGE TEST

DEF PROCEDURE

VALUES FOR THE 0.050 LEVEL =

4.73  4.73  4.73  4.73  4.73

2 RANGES ABOVE ARE TABLE RANGES.
2 VALUE ACTUALLY COMPARED WITH MEAN(J) - MEAN(I) IS:

2.9735 * RANGE * DEGR(1/N(I) + 1/N(J))

TWO GROUPS ARE SIGNIFICANTLY DIFFERENT AT THE 0.050 LEVEL.

APR 87 HEALTH CARE PROVIDERS COMPUTER NEEDS

:54:15 SUPPORT BY GRADE W ES

READING TASK REQUIRED 4.40 SECONDS CPU TIME; 7.03 SECONDS ELAPSED.

100 COMMAND LINES READ.
0 ERRORS DETECTED.
0 WARNINGS ISSUED.
6 SECONDS CPU TIME.
11 SECONDS ELAPSED TIME.
END OF JOB.

.09

.09
Appendix P

Computer Experience by Medical Specialty
### Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>D.F.</th>
<th>Sum of Squares</th>
<th>Mean Squares</th>
<th>F Ratio</th>
<th>P Prob.</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
<th>Minimum</th>
<th>Maximum</th>
<th>95% RP Conf Int for Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Groups</td>
<td>5</td>
<td>88.1519</td>
<td>17.1124</td>
<td>3.888</td>
<td>.037</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>463</td>
<td>2123.1876</td>
<td>4.6194</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>468</td>
<td>2211.3395</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Explanation

- **Source**: The source of variation is classified into groups (Mean Groups and Within Groups).
- **D.F.**: Degrees of Freedom, which is the number of groups minus 1.
- **Sum of Squares**: The total variation of the data from the mean.
- **Mean Squares**: The sum of squares divided by the degrees of freedom.
- **F Ratio**: The ratio of the mean squares of the groups to the mean squares of the within groups.
- **P Prob.**: Probability of the F ratio.
- **Mean**: The mean of the groups.
- **Standard Deviation**: The standard deviation of the groups.
- **Standard Error**: The standard error of the mean.
- **Minimum** and **Maximum**: The minimum and maximum values of the groups.
- **95% RP Conf Int for Mean**: The 95% confidence interval for the mean.
TITLE: RANGE TEST

DEFINITION

VALUES FOR THE 0.050 LEVEL:

\[ 4.73 \quad 4.73 \quad 4.73 \quad 4.73 \quad 4.73 \]

3 RANGES ABOVE ARE TABLE RANGES.
3 VALUE ACTUALLY COMPARED WITH \( \text{MEAN}(J) - \text{MEAN}(I) \) IS:

\[ 1.5925 \times \text{RANGE} \times \text{DEGDF}(1/N(I) + 1/N(J)) \]

(*) DENOTES PAIRS OF GROUPS SIGNIFICANTLY DIFFERENT AT THE 0.050 LEVEL

<table>
<thead>
<tr>
<th>MEAN</th>
<th>GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0221</td>
<td>NURSE</td>
</tr>
<tr>
<td>10.4110</td>
<td>MED FS F</td>
</tr>
<tr>
<td>10.428</td>
<td>PA KO O</td>
</tr>
<tr>
<td>10.6867</td>
<td>ALLERGIC</td>
</tr>
<tr>
<td>10.6538</td>
<td>SURGEONS</td>
</tr>
<tr>
<td>.131</td>
<td>CLINIC</td>
</tr>
</tbody>
</table>

APR 87 HEALTH CARE PROVIDERS COMPUTER NEEDS
:37:47 COMPUTER EXPERIENCE BY SPECIALTY

EXECUTING TASK REQUIRED: 4.24 SECONDS CPU TIME; 5.35 SECONDS ELAPSED.

100 COMMAND LINES READ.
0 ERRORS DETECTED.
0 WARNINGS ISSUED.
6 SECONDS CPU TIME.
9 SECONDS ELAPSED TIME.
END OF JOB.

CF: 05
Appendix Q

Computer Experience by Military Grade
AIR FORCE HEALTH CARE PROVIDERS: AUTOMATION CONCERNING
RELATING TO - NEEDS: (H) AIR FORCE INST. OF TECH
WEIGHT-PATTERSON AFB ON M L FERREY 22 MAY 87
UNCLASSIFIED
APIT/CT/NA-87-1431
AR 87 7 COMMUNICATION GP, WASHINGTON HIS 188/70  COGS-6

SS 1.0 LICENSE NUMBER: 133330

1 0 TITLE "HEALTH CARE PROVIDERS COMPUTER NEEDS"
2 0 SUBTITLE 'COMPUTER EXPERIENCE BY GRADE'
3 0 FILE HANDLE RESPONSE/MATCH "SQM"/RESPONSE'
4 0 SET PRINTBACK=NO

140 WORDS OF MEMORY REQUIRED FOR ONEWAY PROCEDURE.

88E ARE 74603 WORDS OF MEMORY AVAILABLE.
2 LARGEST CONTIGUOUS AREA HAS 74603 WORDS.

APR 87 HEALTH CARE PROVIDERS COMPUTER NEEDS
:41:48 COMPUTER EXPERIENCE BY GRADE

--------------------------------------------------- ONEWAY ---------------------------------------------------

VARIABLE EXPERTISE COMPUTER EXPERIENCE
BY VARIABLE GRADE MILITARY GRADE

ANALYSIS OF VARIANCE

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>D.F.</th>
<th>SUM OF SQUARES</th>
<th>MEAN SQUARES</th>
<th>F-RATIO</th>
<th>PROB.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN GROUPS</td>
<td>5</td>
<td>48.5634</td>
<td>9.7128</td>
<td>1.6251</td>
<td>.2360</td>
</tr>
<tr>
<td>TREATMENTS</td>
<td>484</td>
<td>2230.9115</td>
<td>4.6373</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>489</td>
<td>2339.4959</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

UP COUNT MEAN STANDARD DEVIATION STANDARD ERROR MINIMUM MAXIMUM 95% CONF. INT. FOR MEAN

1 28 10.7222 1.4473 .3411 9.0000 14.0000 10.0365 TO 11.4460
2 28 9.7222 2.1508 .4070 6.0000 14.0000 8.9145 TO 10.5238
3 28 10.5417 2.4077 .1689 3.0000 15.0000 10.2147 TO 10.8365
5 28 10.1750 2.1689 .3954 6.0000 14.0000 9.4965 TO 10.8665
6 28 10.0000 1.6086 .2329 6.0000 15.0000 9.5184 TO 10.4816

DAL 470 10.5021 2.2334 .1030 3.0000 15.0000 10.2397 TO 10.7046

APR 87 HEALTH CARE PROVIDERS COMPUTER NEEDS
:41:48 COMPUTER EXPERIENCE BY GRADE

--------------------------------------------------- ONEWAY ---------------------------------------------------
TITLE RANGE TEST

Hypothesis

VALUES FOR THE 0.050 LEVEL:

\[ 4.73 \ 4.73 \ 4.73 \ 4.73 \ 4.73 \]

RANGES ABOVE ARE TABLE RANGES.

Z VALUE ACTUALLY COMPARED WITH MEAN(J)-MEAN(I) IS.

\[ 1.5712 \times \text{RANGE} \times \sqrt{\frac{1}{n(I)} + \frac{1}{n(J)}} \]

TWO GROUPS ARE SIGNIFICANTLY DIFFERENT AT THE 0.050 LEVEL.

APR 87 HEALTH CARE PROVIDERS COMPUTER NEEDS

:41-98 COMPUTER EXPERIENCE BY GRADE

SOLVING TASK REQUIRED 4.21 SECONDS CPU TIME; 4.98 SECONDS ELAPSED.

100 COMMAND LINES READ.
0 ERRORS DETECTED.
0 WARNINGS ISSUED.
6 SECONDS CPU TIME.
9 SECONDS ELAPSED TIME.
END OF JOB.

Q 0.6

END OF FILE
Appendix R

Computer Support by Medical Specialty Holding ComputerExperience
**ANALYSIS OF VARIANCE**

**SUPPORT FOR COMPUTERS WITH EXPERT SYSTEMS**

**BY AFSCBASI BASIC SKILL WITH EXPERIENCE COMPUTER EXPERIENCE**

<table>
<thead>
<tr>
<th>SOURCE OF VARIATION</th>
<th>SUM OF SQUARES</th>
<th>DF</th>
<th>MEAN SQUARE</th>
<th>F</th>
<th>OF F</th>
<th>SIGNIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAIN EFFECTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AFSCBASI</td>
<td>208.229</td>
<td>6</td>
<td>34.705</td>
<td>7.562</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>208.229</td>
<td>6</td>
<td>34.705</td>
<td>7.562</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>COVARIATES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXPERIENCE</td>
<td>2084.340</td>
<td>1</td>
<td>2084.340</td>
<td>454.138</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2084.340</td>
<td>1</td>
<td>2084.340</td>
<td>454.138</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>EXPLAINED</td>
<td>2292.569</td>
<td>7</td>
<td>327.510</td>
<td>71.358</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>RESIDUAL</td>
<td>2111.243</td>
<td>460</td>
<td>4.590</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>4403.812</td>
<td>467</td>
<td>9.430</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

470 CASES WERE PROCESSED.
2 CASES (0.4 PCT) WERE MISSING.
**MULTIPLE CLASSIFICATION ANALYSIS**

SUPPORT FOR COMPUTERS W/ EXPERT SYS
BY AFSCBASI Basic Skill
WITH EXPERIENCE COMPUTER EXPERIENCE

**GRAND MEAN = \( 15.07 \text{(Sup - 1)} \)**

<table>
<thead>
<tr>
<th>VARIABLE + CATEGORY</th>
<th>N</th>
<th>UNADJUSTED</th>
<th>ADJUSTED FOR INDEPENDENTS</th>
<th>ADJUSTED FOR INDEPENDENTS + COVARIATES (Exp, 1977)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFSCBASI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91 BID</td>
<td>9</td>
<td>-0.40</td>
<td>-0.40</td>
<td>-0.46</td>
</tr>
<tr>
<td>92 PA POD OPT PHY OC</td>
<td>61</td>
<td>-0.46</td>
<td>-0.46</td>
<td>-0.45</td>
</tr>
<tr>
<td>93 MED FS FP PED</td>
<td>146</td>
<td>0.13</td>
<td>0.13</td>
<td>0.22</td>
</tr>
<tr>
<td>94 SURGEONS</td>
<td>57</td>
<td>0.80</td>
<td>0.80</td>
<td>0.17 -</td>
</tr>
<tr>
<td>95 CLINICIAN</td>
<td>61</td>
<td>1.06</td>
<td>1.06</td>
<td>0.38 -</td>
</tr>
<tr>
<td>96 ALLERGIST</td>
<td>3</td>
<td>2.26</td>
<td>2.26</td>
<td>2.10</td>
</tr>
<tr>
<td>97 NURSE</td>
<td>136</td>
<td>-0.74</td>
<td>-0.74</td>
<td>-0.28 -</td>
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</tbody>
</table>

MULTIPLE R SQUARED

<table>
<thead>
<tr>
<th>MULTIPLE R Squared</th>
<th>MULTIPLE R</th>
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</thead>
<tbody>
<tr>
<td>0.047</td>
<td>0.217</td>
</tr>
<tr>
<td>&gt; 0.521</td>
<td>0.722</td>
</tr>
</tbody>
</table>
Appendix S

Computer Support by Computer Experience Holding Military Specialty
**ANALYSIS OF VARIANCE**

SUPPORT SUPPORT FOR COMPUTERS WO EXPERT SAS
BY EXPERIENCE COMPUTER EXPERIENCE
WITH AFBODAS BASIC SKILL

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Signif. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN EXPERIES</td>
<td>2360.210</td>
<td>12</td>
<td>159.561</td>
<td>42.955</td>
<td>0.00</td>
</tr>
<tr>
<td>EXPERIES</td>
<td>2360.210</td>
<td>12</td>
<td>159.561</td>
<td>42.955</td>
<td>0.00</td>
</tr>
<tr>
<td>VARIATES</td>
<td>4.602</td>
<td>1</td>
<td>4.602</td>
<td>4.602</td>
<td>0.00</td>
</tr>
<tr>
<td>AFBODAS</td>
<td>4.602</td>
<td>1</td>
<td>4.602</td>
<td>4.602</td>
<td>0.00</td>
</tr>
<tr>
<td>PLANED</td>
<td>2056.013</td>
<td>13</td>
<td>161.566</td>
<td>39.832</td>
<td>0.00</td>
</tr>
<tr>
<td>MIUS</td>
<td>2056.013</td>
<td>13</td>
<td>161.566</td>
<td>39.832</td>
<td>0.00</td>
</tr>
<tr>
<td>DIL</td>
<td>4453.670</td>
<td>499</td>
<td>8.943</td>
<td>8.943</td>
<td>0.00</td>
</tr>
</tbody>
</table>

470 CASES WERE PROCESSED.
0 CASES (0.00 %) WERE MISSING.

**MULTIPLE CLASSIFICATION ANALYSIS**

SUPPORT SUPPORT FOR COMPUTERS WO EXPERT SAS
BY EXPERIENCE COMPUTER EXPERIENCE
WITH AFBODAS BASIC SKILL

AND MEAN = 15.06

<table>
<thead>
<tr>
<th>UNADJUSTED</th>
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<th>ADJUSTED FOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDEPENDENT</td>
<td>INDEPENDENT</td>
<td>COVARIATE</td>
</tr>
<tr>
<td>N</td>
<td>DEL/N ETA</td>
<td>DEL/N ETA</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>PERIOD</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>1</td>
<td>-4.05</td>
<td>-4.05</td>
</tr>
<tr>
<td>4</td>
<td>-7.95</td>
<td>-7.95</td>
</tr>
<tr>
<td>5</td>
<td>-6.05</td>
<td>-6.05</td>
</tr>
<tr>
<td>6</td>
<td>-4.61</td>
<td>-4.61</td>
</tr>
<tr>
<td>7</td>
<td>-4.18</td>
<td>-4.18</td>
</tr>
<tr>
<td>8</td>
<td>-5.00</td>
<td>-5.00</td>
</tr>
<tr>
<td>9</td>
<td>-1.55</td>
<td>-1.55</td>
</tr>
<tr>
<td>10</td>
<td>-0.09</td>
<td>-0.09</td>
</tr>
<tr>
<td>11</td>
<td>0.82</td>
<td>0.82</td>
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<tr>
<td>12</td>
<td>1.59</td>
<td>1.59</td>
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<tr>
<td>13</td>
<td>2.20</td>
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<tr>
<td>14</td>
<td>2.55</td>
<td>2.55</td>
</tr>
<tr>
<td>15</td>
<td>4.01</td>
<td>4.01</td>
</tr>
</tbody>
</table>

**LITTLE R SQUARED**

<table>
<thead>
<tr>
<th></th>
<th>0.523</th>
<th>0.223</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.725</td>
<td>0.727</td>
</tr>
</tbody>
</table>

**APR 87 HEALTH CARE PROVIDERS COMPUTER NEEDS SUPPORT AND EXPERIENCE HOLDING SPECIALTY**

**CEEDING TASK REQUIRED**

3.94 SECONDS CPU TIME; 4.69 SECONDS ELAPSED.

09 COMMAND LINES READ.
0 ERRORS DETECTED.
0 WARNINGS ISSUED.
3.94 SECONDS CPU TIME.
0 SECONDS ELAPSED TIME.
END OF JOB.

OF 06 EDITION.
Endnotes

1 Grade is generally an indicator of tenure in the service and professional experience.

2 Not all major commands have all three types of medical treatment facilities.

3 Dr. Opsut believed that 600 health care providers were more than enough to give a statistical significant result when using the ANOVA and Two-Way ANOVA. Thus, a response of less than 600 would not diminish the significance.

4 Lt. Colonel Mackie, General DeHart's executive officer, told me that he does not see a problem with getting the survey signed by General DeHart. If there is a problem, I've addressed my alternative in the contingency section.

5 The analysis of variance (ANOVA) is a technique for comparing several populations. It is a special type of multiple regression.

6 When there are two or more factors in an analysis of variance, there may be interactions between the factors. Interaction effects occur when the difference in the responses to the levels of one factor is related to the levels of another factor. In that case, a Two-Way ANOVA is needed.

7 The medical specialties are broken down as follows:

   a) Biomedical (91XX) includes:

      - Clinical Psychologist
      - Psychologist
      - Social worker
b) PA Pod Opt Phy Oc (92XX) includes:
   - Occupational Therapist
   - Physical Therapist
   - Optometrist
   - Podiatry
   - Physician Assistant

c) Med FS FP Ped (93XX) includes:
   - Staff Clinician
   - General Practice Physician
   - Staff Clinician
   - General Practice Physician
   - Family Physician
   - Aerospace Medical Physician
   - Pediatrician
   - Physical Medicine Physician
   - Internist
   - Emergency Physician

d) Surgeons (94XX) includes:
   - Surgeon
   - Urologist
   - Ophthalmologist
   - Otorthinolaryngologist
   - Orthopedic Surgeon
   - OB/GYN

e) Clinician (95XX) includes:
   - Pathologist
   - Diagnostic Radiologist
   - Dermatologist
   - Anesthesiologist
   - Neurologist
   - Psychiatrist
   - Radiotherapist

f) Allergist (96XX) includes:
   - Allergist

g) Nurse (97XX) includes:
   - Nursing Administration
   - Mental Health Nurse
   - Operating Room Nurse
   - Nurse Anesthetist
   - Clinical Nurse
   - Flight Nurse
   - Nurse-Midwife
   - Environmental Health Nurse
Figure Caption

Figure 1. Air Force organization structure. Source: U. S. Air Force Command Organization Chart.
Figure Caption

Figure 2. Organization structure of the Air Force Surgeon General’s Staff. Source: Air Force Pamphlet 23-21, U. S. Air Force Command Organization Chart.
Figure Caption

Figure 3. U. S. Air Force bases with supporting medical treatment facilities. Source: Air Force Magazine.
ATELMED
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