INVESTIGATION OF THE FEASIBILITY
OF AN
ON-LINE POLICY AND PROCEDURE SYSTEM

Project Group #3:
Phillip Antrassian
Cindy Holland
Debbie Stone

Industrial and Operations Engineering 481
The University of Michigan
Dr. Richard J. Coffey, Instructor

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EXECUTIVE SUMMARY

The purpose of this project was to determine the feasibility of putting the University of Michigan Hospital's Policy and Procedure system on-line on the HIS mainframe. Currently the Policy and Procedure System is maintained in a hard-copy form. Updating these manuals is a cumbersome, tedious task, and there is some question as to whether all manuals are actually updated or not. Thus, determining the best way in which the Policy and Procedure System could best serve the University of Michigan medical community was a major concern of this project.

At this time, the engineering team recommends that the manuals be well indexed and cross-referenced, the appropriate print capabilities be incorporated, and the system be put on-line. Findings that resulted in this decision include the willingness of the hospital community to see the change, the determination that satisfaction with the current system is low, and the fact that virtually all of the manual contents lend themselves to a textual format. Additionally, 92% of all manual holders will have HIS access within one calendar year. One must keep in mind, however, that there is little chance that all manual holders will have HIS access in the future. Moreover, although downtime is not a major problem, it is a possibility, and some sort of back-up system should exist for emergencies. Therefore we recommend that some hard-copies be maintained at various locations throughout the hospital.

Users have demanded the ability to easily print entire policies. Currently, HIS does not have the capabilities to meet this requirement, although this is an accomplishable task. If this application cannot be added to the system, implementation should be postponed until appropriate print functions can be added/developed.

Implementing this system requires the creation of a database containing manual contents and the design of a user-friendly interface. Upon implementation, users should be taught how to use the system through training sessions run by HIS. After the system proves itself acceptable, hard copies should be removed from holders having mainframe access.

Through the implementation of this change, the Policy and Procedure System will become a more efficient and usable system.
INTRODUCTION AND BACKGROUND

The objective of this project was to determine the feasibility of putting the University of Michigan Hospital's Policy and Procedure Manuals on an on-line computer system and/or to identify the factors necessary for future implementation of such a system. Our goal was not to force this type of technology upon the medical community, but to determine how the organization would be best served by the Policy and Procedure system.

The complete Policy and Procedure Manual consists of five large volumes: two administrative volumes (Volumes I and II), a clinical diagnostic volume (Volume VI), a clinical therapeutic volume (Volume VII), and a nursing practice volume (Volume VIII). The Standardization of Procedures Committee has also expressed interest in putting the Standard Patient Prep Manual on-line. Approximately 300 persons throughout the University of Michigan medical community hold one or more of the aforementioned volumes.

To update a policy or procedure, the system coordinator issues an updated document which is then distributed to holders of the appropriate manuals. Large packets of updates are generally issued quarterly. It is the manual holder's responsibility to insert any new pages into his or her manual and to discard the outdated pages. There is no way to determine with any degree of certainty whether any given manual is properly maintained or not; therefore users often question the validity of the policies contained in manuals. With an on-line system, the system coordinator would enter these changes directly into the database, thus eliminating the need to distribute updates to the manual holders and increasing user confidence in the accuracy of the policies.

APPROACH AND METHODOLOGY

The project proposal was finalized and signed on February 15, 1989.

This project was divided into four sections:

- Determine the correlation between the current locations of manuals and the locations of terminals through which the on-line system could be accessed
- Gather opinions regarding user satisfaction with current policy system and desirability of an on-line manual system
- Determine whether manual content can easily go on-line
- Investigate financial implications
Determination of Manual Locations vs. Terminal Locations

A current listing of manual locations was obtained from Rick Finger, Coordinator of the UMH Policy and Procedure System. This Condor database needed to be revised due to numerous format errors. Upon completion of this task, the database was sorted according to manual location.

Gail Benjamin, a Nursing System Planner and the team's principle contact at Hospital Information Services, provided the engineering team with a current listing of on-line terminal locations, as well as a listing of those locations which are expected to have on-line access by April of 1990. These listings were then compared to current manual locations in order to determine whether manual users would continue to have satisfactory access to policy and procedure information if the system were to go on-line. A percent correlation (i.e. the percentage of manuals which are located near on-line terminals) was computed and submitted to Gail Benjamin for verification.

Survey of User Opinions

To gather information concerning satisfaction with the current policy and procedure manual system, a one page questionnaire and accompanying cover letter (see Appendix A) briefly explaining the proposed project and importance of user input was distributed to all of the manual holders and members of the Administrative Forum. The questionnaire contained six questions; the user responded to each on a five-point scale. The questions were designed to determine the users' desire for an on-line system, satisfaction with current system, beliefs about whether manuals were kept updated, accessibility of manuals and on-line terminals, and frequency of manual use. A seventh question asked respondents to rank the different volumes from 1 to 5, indicating which volume(s) they would most like to be able to access on-line. The questionnaires were marked in such a way as to allow the engineering team to differentiate between responses from manual holders and Administrative Forum members. Respondents were encouraged to add any additional comments on the back of the questionnaire. A total of 462 questionnaires were distributed.

Analysis of Manual Content

The team analyzed the manual content for pictorial information that would not lend itself to a textual on-line system. The author, or some otherwise interested party, was determined for each of the policies in question. Each was sent a memo (see Appendix B) containing the policy and explaining the dilemma,
and was requested to evaluate the policy and determine whether the pictorial component(s) could be deleted or changed to text without affecting the integrity of the document.

General information regarding the Hospital Information Services' computer facilities and capabilities was obtained from Gail Benjamin. This included information about the type of system that would be used, what its graphics capabilities are, approximate start-up and maintenance costs, system security, and printing capabilities. Ms. Benjamin also discussed an approximate time frame and implementation suggestions, should a decision be made to convert to an on-line system.

Investigation of Financial Implications

Finally, the team considered the financial implications of implementing an on-line system. The cost of maintaining the current system was compared to the cost of establishing and maintaining an on-line system.

ALTERNATIVES AND/OR HYPOTHESES

In conducting this project, two alternatives developed. The first alternative is to put the manuals onto the on-line computer system. The second is to maintain the current hard copy system for the time being. The latter alternative would be used if one or more of the following situations developed:

(i) the correlation between manual and on-line computer terminal locations was too low
(ii) HIS could not support the requirements of an on-line policy and procedure system
(iii) essential pictorial information could not be converted or deleted.

FINDINGS AND CONCLUSIONS

Currently, 74% of manual holders have easy access to an HIS on-line terminal. According to Hospital Information Services, an additional 18% of manual holders are expected to have on-line hook-ups within six months to one year. The latter group includes several clinical laboratories. This will result in 92% of all manual holders having on-line access by April 1990. Every department
requiring patient care data for medical purposes and record-keeping is included in this figure, including all of the nursing units, each of which has 4 to 7 terminals.

Twenty-one manual holders (8%) are not scheduled to have on-line access in the near future. No departments involved with the direct medical care of patients are included in this figure. Examples of these departments are Pastoral Care, Volunteer Services, Management Systems, and Patient Relations (see Appendix C).

An example of this survey along with its accompanying cover letter is included in Appendix A. The survey was sent to two groups of people, manual holders and the Administrative Forum. 62% of all surveys sent out were returned. Due to the similarities found between the groups' responses, the engineering team pooled the two sets of responses. The results of the evaluation are as follows:

Question 1: 47% of respondents indicated that they are extremely willing to see the policy and procedure manuals go on-line in a format similar to that of the Physician's Desk Reference. 21% of the respondents are willing to see this happen. 14% indicated a neutral position and 18% are either opposed or strongly opposed to seeing the system go on-line. See Figure 1.

As indicated above, 89% of the respondents are not opposed to seeing the system go on-line. Additionally, nearly half of the respondents indicated that they are extremely willing to see this happen. The high percentage of respondents who are willing to see the policy system go on-line indicates that there should be a low level of resistance among users to the proposed change.

Question 2: Only 5% of respondents expressed that they are very satisfied with the current manual system. 13% of the respondents indicated satisfaction with the system. 47% indicated no opinion on the subject. 35% expressed varying degrees of dissatisfaction with the current system. See Figure 2.

Of those people expressing an opinion about the current manual system, twice as many indicated dissatisfaction with the current system as those indicating any degree of satisfaction with the system.
Question 1: Would you be willing to see the Policy and Procedure Manual go on-line in a format similar to the PDR?

extremely willing........................................strongly opposed

Figure 1.
Question 2: Are you satisfied with the current manual system?

![Bar chart showing responses to Question 2]

*very satisfied*...............................*very dissatisfied*

Figure 2.
Question 3: 30% of respondents indicated that their manuals are always kept updated. 29% indicated that their manuals are usually kept updated. 19% of respondents indicated a neutral position on the question, and 22% felt that their manuals are not kept updated. See Figure 3.

Although nearly 60% indicated that their manuals are kept updated, the 22% of respondents that felt that their copies are not can lead to a higher degree of uncertainty than is appropriate regarding policy accuracy. It should also be mentioned here that during an informal discussion, one of the head nurses at University Hospital commented that she was frequently contacted by telephone by nursing staff members inquiring as to the validity of various nursing policies contained in the manuals. According to her, the nursing staff seems to have a low level of confidence in the validity of the system; they do not "trust" the manuals to be updated, irrespective of whether they actually are or not.

Question 4: 54% of the respondents feel that they have access to manuals as needed. 31% indicated that they usually have access to manuals when needed. 15% of respondents expressed that they do not have easy access to manuals when needed. See Figure 4.

This indicates that current manual access is sufficient. However, there is some room for improvement.

Question 5: 2% of respondents look at their manuals at least once a day. 10% refer to their manuals several times each week. 32% of respondents feel that they refer to their manuals on a weekly basis, and 56% of those responding feel that they rarely refer to their manuals. See Figure 5.

The fact that over half of the respondents rarely refer to their manuals could be correlated to the fact that 35% of respondents expressed dissatisfaction with the current system and that 22% feel their manuals are not kept updated. It could also be due to overrepresentation of administrative personnel, as opposed to those having more direct patient contact, in the survey.

Question 6: 62% of respondents feel that they have above average access to an on-line terminal. 19% feel that they have average access to an...
Question 3: Is your manual kept updated?

Always..........................................................seldom

Figure 3
Question 4: Do you feel that manual users have easy access to manuals when needed?

<table>
<thead>
<tr>
<th>Number of Responses</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>100</td>
<td>80</td>
<td>60</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>no</td>
<td>45</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

Figure 4
Question 5: How often do you refer to your manual?

<table>
<thead>
<tr>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>200</td>
</tr>
</tbody>
</table>

several times a day...............................rarely

Figure 5
on-line terminal, and 19% of the respondents feel that they do not have access to an on-line terminal. See Figure 6.

81% of respondents feel that they have reasonable access to an on-line terminal. This figure can be compared to the 74% of manual holders that HIS informed the team currently have on-line access. However, an additional 18% of holders are scheduled to obtain access by April, 1990. This indicates that on-line access should not be a problem should the system be implemented, although it is currently a very real concern of many users.

Question 7:

Each of the volumes had a significant representation of respondents who would like to see it go on-line. The Administrative and Nursing Practices volumes were especially popular choices. See Figure 7. One must keep several things in mind when considering this data. For example, many respondents from administrative departments indicated only that they wanted the Administrative volumes on-line, and did not rank the remaining volumes. Many respondents were unfamiliar with the SOPC's Patient Prep Manual.

It should be stressed that the survey conducted was "informal" in that no attempt was made to check the validity of responses, and no detailed analysis of the results was performed. The survey was conducted only to "get a feel" for the general opinions of manual holders. All "reasons" presented above for the various results obtained are simply the speculation of the authors based on comments written on several of the returned questionnaires.

Many of the comments written on the questionnaires dealt with some of the issues that have already been mentioned. Several respondents indicated that updating their manuals was a tedious and time-consuming task that sometimes goes undone. Another very common response was that on-line accessibility needs to be increased.

Other issues raised in several respondents' comments include the following:
- Must be able to print hard copies of policies easily
- Would like/need to maintain hard copy as well
- Information in manuals is hard to find; cross-referencing necessary
- Breakdown/Downtime of HIS seems frequent
- Good idea because manual pages are often found missing on nursing units
Question 6: Please rank your accessibility to an on-line terminal

Number of Responses

1 2 3 4 5

easily accessible..............................not easily accessible

Figure 6
Question 7: Which volume would you most like to see go on-line?

- Nursing Practices: 21.88%
- Clinical Diagnostic: 19.55%
- Clinical Therapeutic: 15.32%
- Patient Prep (SPOC): 13.64%
- Administrative: 29.61%

Figure 7
• Not efficient use of HIS resources

A list of all comments (some paraphrased) is contained in Appendix D.

Twenty-one policies and procedures were found to contain graphic/pictorial elements that would not lend themselves directly to a textual format. To address this problem, each author was sent a memo regarding the possibility of deleting or altering the pictorial information so that the policy could easily be put on-line as text. Not all of the authors have replied to the memo as of this date. Of those that have responded, the response has been overwhelmingly positive toward deleting the elements in question. Additionally, the engineering team has chosen to delete certain graphic elements without explicit author permission; these have included corporate logos or symbols or simple diagrams that are well described in the text. A copy of each policy containing graphic elements that permission has not been given to alter as of this date is included in Appendix E. Also contained in Appendix E is a list of those policies which contain graphic elements that should be deleted.

Hospital Information Systems would be the department actually responsible for putting the manuals on-line on the hospital's IBM 3909 mainframe. Gail Benjamin has indicated that the cost of storage space for the manuals would be minor. The earliest date given for beginning work on this project would be July 1, 1989. The software which would be used for this purpose is "PCS/Online Text", also by IBM; HIS already owns this software. Although all of the hardware is capable of supporting graphics, incorporating graphic elements into the text would be difficult due to software limitations. It would also require a significant amount of a programmer's time.

Approximately 99% of the current manual content has already been put on 5.25" floppy disks; however, only the two administrative volumes have been indexed, and none of the volumes has been cross-referenced. Should the manuals go on-line, the Policy and Procedure System Coordinator would learn how to get onto the system and make appropriate changes and updates; the system's security would of course prevent unauthorized persons from altering the document in any way. At this time, if a user desires a hard-copy of a policy, he or she may do a screen dump, printing out one monitor screen of the document at the time. It has been determined by Gail Benjamin of HIS that the programming in of a printing function is not a minor task, but it is possible.

Costs of the current system include the printing of quarterly update packets and the occasional issuance of new manuals. The updates are sent
through campus mail, requiring seven buffer days for implementation after issuance. Mailing is not a direct cost to Management Systems, although there is a labor cost associated with processing the updates and within the campus mail service. For the 1988 calendar year, 4 update packets were issued for each manual, incurring printing costs of $2309.43 to Management Systems. The processing costs are less than $100 and the incremental costs for delivery through campus mail are so small as to be negligible. These two costs will not be addressed. The largest single cost incurred with updating the manuals is the Policy and Procedure System Coordinator's time. No significant change in the workload of the coordinator is foreseen; therefore, this cost is also not addressed.

Only 74% of the current manual holders have on-line access at this time, resulting in a printing cost of $600 to Management Systems for manual updates for the first year of implementation. Thus Management Systems saves $2300-$600 or $1700 in printing costs during the first year. In the second year and thereafter, 92% of manual holders are projected to have on-line access, resulting in printing costs of $185 (8% of 1988 printing costs) to Management Systems for those 8% not on line. This will yield a savings of $2125. These additional printing costs should decrease as computer accessibility spreads throughout the medical center.

An additional initial cost to Management Systems during the first year is the cost associated with having the manuals indexed and cross-referenced. This function would be performed with Management Systems' existing resources and thus incurs no incremental cost to the department. The opportunity cost associated with the completion of this task may be significant, but has not been determined.

According to figures obtained from Gail Benjamin of HIS, the cost to HIS of implementing the system will be less that $800 (10 working days of a programmer currently employed by HIS paid $29,000 yearly). This yields a savings for the University of Michigan Hospitals of $2300 - (800 + 600) or $900 for the first year. However, additional costs will be incurred by HIS due to the necessity of additional programming to include the desired printing functions and the need for some sort of training session for users of the system. Neither of these are incremental costs to HIS since they would be performed using existing resources, but again, there are undetermined opportunity costs associated with each. Therefore, the University of Michigan Hospitals could lose money on the project during the first year. In subsequent years, however, the system would pay for itself.

In addition to this reduction in direct costs, there are qualitative benefits associated with an on-line system as well. This includes elimination of the 7
buffer days required for policy implementation as well as the need for manual holders to update their volumes.

RECOMMENDATIONS

The engineering team recommends that the Policy and Procedure Manuals should be put on-line only if suitable print capabilities can be developed by HIS. This decision was based upon the findings reiterated below:

- The survey responses indicated low amounts of opposition to seeing the policy system go on-line.
- Management Systems and the University of Michigan Hospitals would save money on the venture in the long run.
- According to HIS, within one calendar year 92% of all manual holders will have HIS access, including all patient care units.
- Users indicate only a moderate level of satisfaction with the current Policy and Procedure system.
- Users tend to have low confidence in the updatedness of their manuals.
- Nurses comment that they often find pages and/or entire policies missing from their manuals.
- Since there are only approximately 10 policies containing graphic elements, it seems unreasonable that this should keep the entire system from going on-line.

However:

- Users have demanded the ability to print entire copies of policies easily and this capability does not exist at the current time, other than by means of successive screen dumps. This is a tedious process.
- Many users have implied that they require a hard copy of the manual as well due to their perceptions of the downtime of the system. If both systems would have to be maintained, there would be no savings to Management Systems.
- There is little chance that all manual holders will ever have HIS access, therefore a dual system will always have to be maintained to some degree.
A requirement of the system must be that a user can print a policy or part of a policy easily. A print function facilitating this does not exist currently. The team has been informed by the project coordinator at HIS that it is possible to program in the desired print function. The cost of this endeavor is not available at this time because the programmer who would be responsible for this activity is temporarily unavailable. This information can be obtained from HIS in the near future.

One caveat should be included at this time. Although the mainframe computer is seldom down, several users (nurses in particular) have indicated that they would require a hard-copy of the manuals for backup, in case this situation should arise. If the goal of this project is to save time and money for Management Systems, maintaining a dual system in this way would obviously defeat the purpose. However, many of the above users (nurses) have also indicated that for the most part they would welcome an on-line system because it would ensure that manual content is always updated and easily obtainable. Therefore if the primary goal is to best serve the manual users, an on-line system could greatly contribute to this.

POSSIBLE DIRECTIONS OF FURTHER STUDY

The engineering team has only considered the implementation of this project using the facilities currently available through Hospital Information Services, and has discovered that HIS does not have the capabilities necessary for this project at this time. If Management Systems wishes to pursue this matter further, they may choose to look into non-HIS options. One possibility is to put the system on the Michigan Terminal System (MTS) rather than the HIS mainframe. Although the team has not investigated this option, it is known that MTS storage space is very costly, and downtime of the system is greater than is acceptable for this application. Another possibility is to purchase a commercial software package designed for this type of use that contains the desired functionalities. These options are both likely to have large incremental costs.

ACTION PLAN

Before putting the system up, Management Systems must arrange to have the manuals indexed and cross-referenced. The on-line Policy and Procedure system should then be implemented according to a format similar to the one
followed when the Physician's Desk Reference went on-line. However, the system developed must have better printing capabilities than the Physician's Desk Reference currently contains. The entire manual should be put on-line at once and tested by HIS to get as many bugs out as possible. This would be followed by a few large demonstration/training sessions run by HIS to demonstrate to manual holders the appropriate procedures for referencing policies and procedures. Users should be reminded at this time that all terminals have red HIS "Help" stickers on them; by dialing the phone number on this sticker, the user can have his/her questions about the system answered 24 hours a day, 7 days a week. Additionally, a Quick Guide handout should be developed and distributed which contains all of the information presented in the training session. Once the system is up and working smoothly, a schedule should be distributed to all manual holders having HIS access, informing them that as of a given date they will no longer receive hard-copy updates, and their manuals will be removed. Manuals should not be collected until the system has proven itself reliable. As additional manual holders gain on-line access, they should be taught how to use the system and their manuals collected. Thereafter, users would be informed of policy changes through the UMH Bulletin.
## Appendices

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<th>Page</th>
</tr>
</thead>
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<td>21</td>
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<tr>
<td>B</td>
<td>Request to authors to alter / delete graphic elements.</td>
<td>23</td>
</tr>
<tr>
<td>C</td>
<td>Manual holders not expected to receive on-line access within the next year.</td>
<td>25</td>
</tr>
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<td>26</td>
</tr>
<tr>
<td>E</td>
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<td>30</td>
</tr>
</tbody>
</table>
APPENDIX A:
QUESTIONNAIRE AND COVER LETTER SENT TO MAUNAL USERS

UMH Policy and Procedure Manual Survey

1. Would you be willing to see the Policy and Procedure Manual go on-line in a format similar to that of the Physicians' Desk Reference?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>extremely willing</td>
<td>neutral</td>
<td>strongly opposed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Are you satisfied with the current manual system?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>very satisfied</td>
<td>neutral</td>
<td>very dissatisfied</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Is your manual kept updated?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>always updated</td>
<td>neutral</td>
<td>seldom updated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Do you feel that manual users have easy access to manuals when needed?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>usually</td>
<td>no</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. How often do you refer to your manual?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>several times a day</td>
<td>daily</td>
<td>several times a week</td>
<td>weekly</td>
<td>rarely</td>
</tr>
</tbody>
</table>

6. Please rank your accessibility to an on-line terminal:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>easily accessible</td>
<td>average</td>
<td>not easily accessible</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. As it may not be possible to put all volumes of the manual on-line at once, please indicate which volume(s) you would most like to see on-line. Please rank the volumes from 1-5 (1 = highest preference to go on-line):

- Administrative Volumes (I & II)
- Clinical Diagnostic Volume (VI)
- Therapeutic Volume (VII)
- Nursing Practice Volume (VIII)
- Patient Prep Manual (SOPComittee)

Please feel free to add any additional comments regarding the current manual system as opposed to an on-line manual system on the back of this page.

PLEASE RETURN THIS SURVEY BY MARCH 31, 1989 TO RICK FINGER, MANAGEMENT SYSTEMS, NI-6A19/0443 (ADDRESS ENVELOPE ATTACHED).
Dear Fellow Staff Member:

Management Systems is currently investigating the feasibility of putting one or more volumes of the UMH Policy and Procedure Manual on-line on the UMH mainframe computer rather than maintaining it in its current hard copy form. If an on-line system is implemented, manual users will be able to access manual material through any HIS mainframe terminal. Such a system would relieve manual holders of their responsibility for updating the manuals, as well as assuring manual users that the manual content is always up to date.

The willingness of manual holders and users to adapt to an on-line system is crucial for the success of such a system. We are therefore interested in any opinions you hold regarding the value of an on-line system versus the current manual system. Please take a moment to complete and return the short survey in the attached addressed envelope by March 31, 1989. Feel free to include any additional comments regarding the proposed system on the back of the page.

Thank you for your time.

Sincerely,

Rick Finger
UMH Policy Coordinator
APPENDIX B:
REQUEST TO AUTHORS TO ALTER/DELETE GRAPHIC ELEMENTS

UNIVERSITY OF MICHIGAN HOSPITALS

TO: (Author or Interested Party)
FROM: Student Engineers, UMH Policy Office
RE: Alterations of Graphic Elements Contained in Policies
DATE: 5 April 1989

A student engineering team, in conjunction with the UMH policy office, is currently investigating putting the UMH policy system "on-line" on the HIS mainframe computer. A difficulty with this is the lack of current ability to integrate graphic elements with text.

You have been identified as an author or otherwise interested party of a policy currently containing one or more graphic elements. We would appreciate your input regarding the necessity of retaining this element(s) in the document and/or the possibility of converting it into text.

Enclosed is a copy of the policy/procedure in question. Please examine the graphic portion and complete and return the attached form by April 14, 1989, to Rick Finger, Management Systems, NI-6A19/0443. Your input is vital to the success of this project.

Thank you.
After examining the graphic portions of the policy/procedure in question, please complete this form by indicating the appropriate option and providing the requested information.

___ The graphic elements contained in this policy may be deleted.

___ The graphic elements contained in this policy may be converted to the following text:

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________

___ The graphic elements contained in this policy cannot be deleted for the following reason(s):

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________


Please return the completed form by April 14, 1989, to Rick Finger, Management Systems, NI-6A19/0443.
APPENDIX C:
MANUAL HOLDERS NOT EXPECTED TO RECEIVE ON-LINE ACCESS
WITHIN THE NEXT YEAR

Carole Weber  
Tech. Processing  
loc: Taubman Library

Leslie Misher  
Environmental Hlth. & Safety  
loc: NI 2B01/0458

Louise Palazzola  
Pastoral Care  
loc: UH 2A220/0062

Darlene Billau  
Medical / Research Purchasing  
loc: NI 3B04/0494

Cynthia Jones  
Friends Gift Shops  
loc: UH 2C201/0061

Debbie Wasik  
Plant Support Services  
loc: NI 4F43/0478

Linda Harper  
Patient Relations  
loc: UH 2C223/0058

Virginia Negrucci  
Mgmt. Systems  
loc: NI 6A14/0443

Casey White  
Curriculum Affairs  
loc: 2715 Furstenberg/0611

Frederick Hammond  
Internal Audits  
loc: NI 7C07/1432

Katy Bauer  
University Audits  
loc: 3048 Ad Serv. Bldg.

Thomas Bauld  
Biomedical Engineering  
loc: B2A201/0002

Alicia Rivera  
Security Services  
loc: C 1072/0810

Joan Iannelli  
Plant Support Services  
loc: UH B2C203/0012

Pamela Fogarty  
Univ. Hosp. Volunteers  
loc: C 219/0828

Rick Finger  
Mgmt. Systems  
loc: NI 6A19/0443

Ann Munro  
Patient/Staff Relations  
loc: C 246/0822

Julie Schiebold  
M/W/H Volunteer Svcs.  
loc: F 8419/0250

Carolyn Fosselman  
Psychiatry School  
loc: CAPH P313/0706

Brown Kinnard  
Pastoral Care  
loc: F 8412/0250

Sara Hickey  
Patient & Family Relations  
loc: F 4513/0220
APPENDIX D:
COMMENTS MADE BY MANUAL HOLDERS AND USERS

Number of respondents with similar comments indicated in parentheses.
Some comments are paraphrased.

Great idea. (16)

I am a manager in Clinical Services. It is my staff who update the manuals...would eliminate the need of our doing this tedious task...I am in favor of going on-line.

This would be helpful to that large group of people who rarely access the manual.

Great idea. What will Richard Coffey think of next? Staff don't trust the info is current therefore they ask managers, peers, etc.

Rick, there have been all sorts of discussions of "Intro Services" around campus for storage and retrieval of text info, such as policies, manuals -- Audit has shown interest for the SPG manual. We're investigating such things for job positions -- I'm not familiar with what HIS has done - movement in this direction seems to make sense to me.

I am answering as a unit clerk supervisor who receives revisions for all the UH Inpatient Units. I can't believe this would be easy, but if the Head Nurses have not been asked, they should be. Inpatient units have a problem with pages/policies disappearing from the books. What a nice solution this would be.

Good: Will save on money and staff time. (11)

Good: Policies will always be kept updated. (9)

Don't know if manual is kept updated or not. (6)

Consult manual intermittently -- However, when needed it should be current.

They don't use it often because it is out of date. (2)

I don't use my volumes. I do not update them and if I need to refer to one, I have access to others.

Current manuals too big. (2)
Do not use manuals as much as like because *cumbersome* and *out of date* at times.

Manual kept updated, but with great difficulty.

Needs to be a yearly check to make sure they're totally updated.

Manual is kept updated whenever we get new material. (3)

*Satisfied* with current manual system - I don't have a copy. (3)

Manuals are not easily accessible to all users.

Prefer keeping a hard copy available.

Must be able to print hard copy easily. (7)

Would need to maintain hard copy as well, due to low terminal accessibility. (4)

I don't use it often enough to make checking a hard-copy a problem.

Put computers and printers in the nursing offices on each unit.

Need to increase on-line accessibility. (15)

No on-line system available in OR.

My concerns are that they would not be utilized due to

(i) difficulty at times of accessing hardware (large volumes of users on 2 terminals during peak times)

(ii) unfamiliarity -- unless the staff use use an application frequently, they tend to be "afraid" of it and not use it. An example is the On-line Reference text, which is not frequently used.

(Comments from user on a nursing unit.)

Don't know accessibility to terminal.

Very willing IF HIS accessibility increased (currently not easily accessible).

Needed: several administrative departments clinical labs (3)
As...the union representative of...employees who are accountable...for knowledge of manual content, I am opposed to the replacement of the current hard copy form and the updates....We do not have an HIS terminal. I do not expect in my lifetime that the UMH will see fit to extend HIS to the UMNPC office building at 929 E. Ann Street. Since I must refer to one or all of the volumes 6 to 10 times a day (including week ends), I do not look forward with great joy or even minimal enthusiasm to dashing to NIB or UMH to access a mainframe terminal...My opposition is not reluctance to change...there is still a need by regular users for the hard copy...if you have any suggestions or direction in obtaining HIS in our office, please contact me. -Margo Baron, R.N., Chairperson, UMPNC

Wonderful idea...drawback is that the University isn't moving very quickly in getting its departments on-line...doesn't seem to be a high priority...Our department has been waiting....since last April ('88)...an on-line system is long overdue.

Info in manuals hard to find (cross indexing necessary). (13)

The numbering system to look up a policy must be cleaned up. The present system makes it impossible to use the manuals easily. People have a tendency to ignore needed validation of information because it is so difficult to find things.

Breakdown/Downtime of HIS system seems quite frequent. (5)

I don't feel the manual needs to be on-line at this time. There are many higher priorities such as on-line budgeting, expenses, and capital plan.

Waste of time and money. Do something really needed, not this project.

My main concern is how to access the information if the system goes down. Nursing staff utilize the Clinical Nursing Practice Manual quite frequently and would feel the need to have backup manual for times of system being nonfunctional. Otherwise I feel it would be great!

Recognizing that "everything has its price", I have a philosophical objection...To do so will inevitably cause other systems and applications to be delayed in their development or to be deferred. I think HIS mainframe applications development should be preceeding from a plan. I believe there are numerous applications that are more critical to the hospital than this one. I do not believe that we should place systems like this
one, cafeteria menus, etc. on the mainframe without priority -- necessitating bigger and bigger mainframes and more and more mass storage. The monitored report reveals that we are already spending considerably more on D.P. than the average for comparable hospitals. Under that circumstance, we need to be much more targeted in our use of computing resources.

I find the format of the PDR very confusing. (2)

Not familiar with the PDR.

Fear that online system would be difficult to use, tedious to scroll through. (2)

Staff aren't well educated in computer use. (2)

The manuals are easily accessible; the drawback is that they can easily "walk off".

Current [hard copy] system is relatively inaccessible for the staff.

How would I be notified of updated or new policies if the system was only online? How could I get a hard copy of a policy to share to ensure that all staff has received notification?

Would it be cost-effective to go online?

Do you foresee any charge to the user?

Is it possible to put the SPG on-line? (4)

This is a waste! We should do away with!
APPENDIX E:

POLICIES AND PROCEDURES CONTAINING GRAPHIC ELEMENTS.
The following policies/procedures currently contain graphic elements which should be deleted before attempting to put the manuals on-line:

60-11-043
61-05-001
61-05-002
61-05-003
61-05-020
62-02-004
62-02-010
63-02-018
63-02-043
63-02-052
304-1
Following are those policies and procedures for which permission has not been granted to remove the graphical elements. No responses have been obtained from the authors of these policies regarding the necessity of retaining these elements.
I. PURPOSE.

A. To obtain pulmonary artery pressures at the bedside.

1. Pulmonary artery diastolic and pulmonary capillary wedge pressures reflect left ventricular end diastolic pressure (LVEDP), when the left atrium, left ventricular, and pulmonary vascular bed are one chamber. These pressures are used to:

   a. Detect early or impending left ventricular failure.
   b. Measure circulatory status: fluid balance, vascular tone, and pump function.
   c. Assess hemodynamic effects of medications.
   d. Evaluate changes in left ventricular end diastolic pressure.

B. Patients with complete left bundle branch block and bacterial endocarditis are at a higher risk for complications.

II. POLICY.

A. Decision for insertion of Swan-Ganz catheter is made by physician.

B. Procedure is explained and permit is obtained by physician.

C. Placement and repositioning of catheter is performed by physician.

D. Chest x-ray is ordered and evaluated by the physician.

E. Heparinized flush solution under pressurized continuous infusion is used to maintain catheter patency.

F. Recommended duration of catheter placement is seven (7) days (per Infection Control Committee).

G. Distal port will not be used for parenteral therapy, unless contradicted by unit-specific policy.

H. Blood specimens may be obtained from catheter on physician order by specially trained physicians, nurses, or respiratory therapists, per physician order.

I. Cardiac output measurements are performed by specially trained physicians, nurses, technicians, and respiratory therapists as unit-specific policies state, on physician order.
III. PRECAUTIONS.

A. Prevention of Infection - Local and Systemic

1. Etiology: Break in sterile technique during insertion, dressing changes, line management, or interruption of the closed system.

2. Nursing Implications
   a. Maintain sterile technique during set-up and insertion process. Wear gloves, gown, mask, cap as appropriate.
   b. Inspect insertion site daily for signs of inflammation and phlebitis. Notify physician if noted. Document.
   c. After daily inspection and prn (eg. contamination of dressing) apply occlusive sterile dressing, using Betadine ointment on insertion site.
   d. If drainage noted at insertion site, obtain a specimen for culture.
   e. Maintain sterile technique when changing flush solution bags and tubing every 24 hours.
   f. Maintain sterile technique when changing total flush system including transducer dome every 48 hours.
   g. Heparinized saline is the preferred flush solution.
   h. Minimize breaks of integrity of the closed system.
   i. Cap all stopcock ports.
   j. After obtaining blood specimens from any lumen, flush blood from stopcock ports prior to capping. (See Unit Procedure).
   k. If balloon has ruptured, turn stopcock off to atmosphere, seal shut and label: "Balloon Ruptured - Do Not Attempt Inflation".

B. Thrombosis (as indicated by dampened wave form*)

1. Etiology: clot or fibrin formation at tip of catheter.

2. Nursing Implications
   a. Maintain continuous, pressurized flush of heparin solution of 1-2 units/cc through distal lumen. (Consult Unit Procedure Manual for concentration of specific solution).
   b. Maintain continuous infusion, I.V. line or pressurized flush system, through the proximal lumen.
   c. If thrombus formation suspected, and pulmonary artery wave form is dampened:

*depressed amplitude of wave form
1. Withdraw a 3cc specimen and discard prior to irrigating, then flush briskly using the flush device or a syringe.
2. Open balloon lumen to air to allow passive deflation in case it has not been totally evacuated. (Never aspirate manually with syringe. It is unnecessary and decreases balloon life).
3. Check that:
   a. pressurized tubing and transducer dome have no air bubbles.
   b. pressure bag is at 300mm Hg.
   c. dome and connections are tight and intact.
   d. all atopcock positions and integrity of system are maintained.
   
   d. Notify physician if wave form continues to be dampened when all above interventions fail to correct it.

C. Thromboembolus (may be indicated by rapid deterioration of patient's physical condition).

1. Etiology
   a. Dislodging of clot at tip of catheter during forced flushing.
   b. Dislodging of clot during catheter removal.

2. Nursing Implications
   a. "(See III, B.2. above)"
   b. Observe for and notify physician of acute:
     1. Decreased pO2 and increased pCO2
     2. Increased respiratory rate
     3. Increased respiratory effort
     4. Rales over one lung field
     5. Hemothysis
     6. Wheezing
     7. Pleuritic chest pain
     8. Increased PADP with normal PAWP
     9. Change of mental status, or neurologic function

D. Pulmonary Artery Rupture (as indicated by rapid deterioration in patient's physical condition).

1. Etiology
   a. Over-inflation balloon
   b. Excessively rapid inflation of balloon
   c. Catheter tip laceration
2. Nursing Implications

a. Observe for and notify physician of
- rales acutely over one lung field
- patient complaints of "bubbling in widepipe"
- deteriorating cardiopulmonary status
b. Observe for changes in waveform and transduced PAS, PAD, and PAW pressures.
c. Inflate balloon slowly while observing waveform. Never inflate beyond a "wedged" waveform.
d. The full capacity of the balloon may not be required to give a wedged position. Never inflate a balloon with greater than the volume of its printed capacity.
e. A chest x-ray should be ordered and evaluated after catheter placement, or at the time of an acute cardiopulmonary decompensation.

E. Pulmonary Infarction

1. Etiology

a. Catheter tip migration to a wedge position for extended period of time (as little as 5-8 minutes may cause infarction).
b. Balloon left inflated in wedge position for an extended period of time.
c. Pulmonary artery rupture.

2. Nursing Implications

a. Observe for and notify physicians of
- increased PADP with normal PAWP
- decreased \( pO_2 \) and increased \( pCO_2 \)
- increased respiratory rate
- chest pain (pleuritic)
- change in ability to obtain readings
b. Allow balloon to passively deflate (open to atmosphere) after each wedge reading. Cap the port closed to atmosphere with an empty syringe between reading to prevent accidental inflation.
c. Maintain the pulmonary artery waveform on the oscilloscope for continuous monitoring of catheter tip location. When drugs are infused per distal port check the waveform every 30 minutes and document.

F. Arrhythmia (PVC's or heart block)

1. Etiology

a. Endocardium irritated by catheter may cause PVC's, V. Fib., V. tach.
b. Right Bundle Branch (RBB) damaged by catheter trauma may cause complete heart block in patients with preexisting complete Left Bundle Branch Block (CLBBB).

2. Place patient on cardiac monitor.

3. Nursing Implications During Insertion
   a. Observe monitored rhythm closely.
   b. Have venous access readily available.
   c. Have lidocaine, insoproterenol, as well as defibrillator, available.
   d. Have pacing equipment available if patient has CLBBB.

G. Pneumothorax or Hemothorax
   1. Etiology: Laceration of blood vessel and lung tissue.
   2. Nursing Implications during insertion
      a. Observe for and notify physician of:
         - increased respiratory rate
         - increased respiratory effort
         - absence of breath sounds unilaterally or over one lung field
         - hemoptysis
      b. Have emergency equipment for chest tube placement available.

H. Air Embolism
   1. Etiology: Infusion of air into patient with pressurized system or through ruptured balloon.
   2. Nursing Implications
      a. Maintain closed system with tight connections and capped ports.
      b. Check for cracks in dome, stopcocks, or connections if air bubbles develop in system.
      c. Maintain correct positions of stopcocks.
      d. If balloon presumed to be ruptured by blood return from balloon port or inability to obtain a wedge reading, close port to atmosphere, seal, and label "Balloon Ruptured - Do Not Attempt Inflation". Notify physician.

I. Intracardiac Knotting or Catheter Kinking
1. Etiology: Rapid advancement of catheter during insertion, causing catheter slack inside the heart to know in the turbulence.

2. Nursing Implications
   
a. Monitor procedure and identify potential problem if catheter is advanced rapidly.
   
b. Note that this diagnosis is made by chest x-ray.

IV. EQUIPMENT NEEDED FOR SWAN-GANZ INSERTION.

A. Essential for all sites

   Pressure Monitor Setup (see Unit Policy Manual for specific setup)
   Swan-Ganz catheter: double, triple lumen, or thermodilution catheter
   IV setup for proximal lumen
   Sterile gowns, gloves, towels
   Masks, caps
   Xylocaine 1% solution (local anesthetic)
   Lidocaine (IV bolus)
   Antiseptic solution (e.g. Betadine)
   Antiseptic Ointment (e.g. Betadine)
   Suture material (2-0 or 4-0 silk with needle)
   Tape
   4 X 4's

B. The following is optional in some units:

   Sterile Basin
   10cc syringes with caps
   Decanter tubing sets
   NaCL 0.9% 250cc bag
   Bedside fluoroscopy equipment

C. Additional equipment needed for Antecubital Insertion

   Cutdown tray
   Introducer, #16 needles
   Armboard (long)
   Kerlix
   Suture material 3-0 or 4-0 cardiovascular ties)

D. Additional equipment needed for Subclavian Insertion
Subclavian tray
Introducer or cordis catheter #8 French
TV setup for cordis catheter (if used)

E. Necessary equipment needed nearby on unit

- Arrest cart with defibrillator
- Emergency medications including Lidocaine
- Chest tube insertion equipment
- Pacing equipment if patient has CLBB

V. PATIENT INSTRUCTION.

A. Encourage patient and family to express feelings, and ask questions concerning procedure.

B. Re-inforce physician's explanation of procedure.

C. Explain sensations patient may anticipate, e.g., numbness at site, flutter in chest if arrhythmias occur.

D. Explain activity limitations required for duration of catheter placement.
   1. Subclavian insertions: "quiet" arm activity, avoid reaching overhead.
   2. Antecubital insertion: minimal restrictions.
   4. Femoral insertion: flexion of hip joint involved limited to less than 45°, patient will be maintained on bed rest.
   5. Further activity limitations to be determined by patient's status and activity level prescribed by physician.

VI. PROCEDURE.

A. Insertion of balloon-tipped catheter (performed by the physician):
   1. Sites for Catheter Insertion: Antecubital fossae veins, external or internal jugular vein, subclavian vein or femoral vein.
   2. Skin preparation: Shave site if appropriate, apply iodine preparation and allow to dry.
   3. Set up sterile field at site for insertion.
4. Test integrity of balloon by injecting specified amount of air into balloon while it is submerged in a sterile heparinized saline solution. (Usual is 1-2U/cc in 500cc unless physician specifies other).

5. Flush catheter with heparinized saline, wipe outside of catheter with heparinized saline.

6. Connect catheter to pressure monitoring lines and transducer.

7. Perform a cutdown or percutaneous catheterization under sterile conditions.

8. Insert the catheter into the vein, advance the tip to the thorax (the balloon may be partially inflated when the tip of the catheter reaches the shoulder to aide passage into the superior vena cava or the right atrium).

9. Inflate the balloon to capacity in the right atrium. Advance the catheter from right atrium to right ventricle to pulmonary artery. The pressure wave form is continuously monitored and will change as the catheter is advanced until the balloon "wedges" against smaller pulmonary walls. The balloon is then deflated.

10. During the catheter advancement, make pressure measurements in each chamber.

11. Position the catheter so that the PA pressure wave form is obtained with the balloon deflated and the dampened left atrial pressure wave form is obtained when the balloon is inflated to capacity.

12. When a cutdown is performed, the incision is sutured, the catheter is sutured in place and secured with tape distal to the insertion site.

13. Sterile dressing is applied with iodine based ointment.

14. Obtain portable chest x-ray to verify catheter placement - immediately.

B. Nursing responsibilities before and during insertion.

1. Set up calibration and balancing of pressure monitoring equipment, maintaining sterile procedure and following unit-specific guidelines.

2. Aid physician in the set up and provision of materials before and during procedure.

3. Monitor patient's vital signs and cardiac rhythm.
4. Monitor pressure wave form patterns, obtain wave forms on recorder strips if possible and record pressure measurements obtained as catheter is advanced.

VII. NURSING RESPONSIBILITIES AFTER INSERTION.

A. Direct patient care: see Standard Nursing Care Plan for patients with Swan-Ganz catheter (see RESOURCES XIII below).

B. Observe and document pressure readings.

1. To obtain pulmonary capillary wedge pressure
   a. Remove syringe from balloon port, verify pulmonary artery wave form on pressure module.
   b. Identify balloon capacity as labelled on outside of catheter. Use smallest syringe available to give necessary quantity of air (do not use TB syringe).
   c. Inflate balloon slowly, watching pressure wave form. Use only quantity of air needed to create "wedge" pressure wave form. If this is less than balloon capacity or is a reduction from the amount previously necessary to "wedge" the balloon, document this change.
   d. After PAWP is obtained, remove syringe, open balloon lumen to air and allow passive deflation of balloon. Check pressure wave form to see if it has returned to Pulmonary Artery configuration. Re-cap the balloon port with the emptied syringe.

2. Ventilators may give false high readings: take consistent readings, all-on or all-off respirators.

3. If possible, have patient stop breathing during expiration while obtaining "wedge" pressures. Wedge pressures are obtained with the pressure module in the MEAN mode or taken off wave pattern.

4. All readings are obtained with the transducer at the level of the right atrium. All readings should be obtained with the patient in the same position.

C. Maintenance of System.

1. Set up pressure monitoring equipment following sterile technique. Refer to reference materials on unit.

2. Calibrate functional pressure systems.
a. Check calibration every 8-24 hours depending on equipment. (refer to reference materials on unit for proper calibration procedure).
b. Balance system to atmosphere every four hours.

3. Balloon Care
   a. only inflate balloon with its prescribed volume capacity or less.
   b. in patients with potential right-to-left shunts use CO2 to inflate balloon.
   c. trouble shoot for inaccurate pressure wave forms (see Table 2)
   d. When transporting the patient place them on ECG monitor and continue pressure monitoring if possible.

VIII. MEDICAL RECORD DOCUMENTATION.
A. Pressure readings, wave patterns.
   1. Normal Pressure.
      a. Right Atrium: 1 - 6 mmHg
      b. Right Ventricle Systolic: 20 - 30 mmHg
         Diastolic: <5 mmHg
      c. Pulmonary Artery Systolic: 20 - 30 mmHg
         Diastolic: <10 mmHg
         Mean: <20 mmHg
      d. Pulmonary Artery Wedge: 4 - 12 mmHg

2. See Table 1, "Standard Wave Forms".

IX. INTERPRETATIONS.
A. See Table 2 (attached)

X-XI. NOT APPLICABLE.

XII. EXHIBITS.
A. Table 1, Standard Wave Forms
B. Table 2, Trouble Shooting
C. Guidelines for Invasive Pressure Monitoring

XIII. RESOURCES.
A. Coronary ICU—10 East Nursing Staff, University Hospital
B. Cardiology Fellows

C. Maintenance department for module/transducer difficulties.

D. Standardized Nursing Care Plan for Patient with Swan-Ganz Catheter
   Approved: January, 1980, Medical Surgical SNCP Committee

E. Environmental Control Committee for cleaning and storage of equipment.

XIV. AUTHOR/CONSULTANT.

| AUTHOR:  | Janet Fredal, AHN  |
| CONSULTANTS: | Inter ICU Head Nurses |
| TITLE: | Service Chief, Cardiology |
| DEPARTMENT: | Internal Medicine |
I. Arterial Wave Forms:
A. Encountered in:
   1. Systemic Arterial Lines (Radial, Brachial, Femoral)
   2. Pulmonary Artery Lines (Swan Ganz)
B. Characteristics:
   1. Saw Tooth Pattern, High Amplitude
   2. Systolic Phase:
      a. Pulmonary: at end of ECG's - QRS complex
      b. Systemic: delayed after ECG's - QRS complex, determined by distance from LV
   3. Diastolic Phase: Slow decrease in pressure occurring after dichrotic notch unit next systolic ejection.
C. Normal Measurements:
   1. Pulmonary 25/14, mean = 18
   2. Systemic 120/60, mean = 80
III. Ventricular Waveforms

A. Encountered in: Right Ventricle, Left Ventricle

B. Characteristics:
   1. Square Waveform
   2. High Amplitude
   3. Systolic Phase
      a. Vertical rise in pressure occurring at end of QRS complex
   4. Diastolic Phase
      a. Vertical fall in pressure occurring with T wave
      b. Slow rise in pressure: with passive filling of ventricle and atrial contraction; corresponds with ECG's P wave and early QRS complex.

C. Normal Pressures:
   Right Ventricle: 25/0-5
   Left Ventricle: 130/0-5
I. POLICY/PROCEDURE PURPOSE AND MECHANISMS

A. The electrophysiology study (EPS or Programmed Electrical Stimulation) is the recording of the intracardiac electrogram (internal EKG). It is based on the principles of electricity and utilizes sophisticated recording devices. Present applications include (1) arrhythmias, (2) therapeutic evaluations for selection of treatment modalities (drugs, surgery, catheter ablation, antitachycardia devices, implantable defibrillators or cardiac pacemakers), and (3) as a prognostic tool for treatment efficacy.

B. The study is a systematic evaluation of the patient's electrical (conduction) system. The patient is transported to the special procedures room in the cardiac catheterization suite. Once comfortable, the patient is prepped and draped. A venous approach is used as the entry site, usually femoral or an upper extremity vein. A local anesthetic is injected to avoid discomfort. Using the percutaneous technique one to five electrode catheters are inserted and positioned at predetermined cardiac locations (right atrium and right ventricle). Left ventricular catheterizations are at times performed using a femoral artery. In some cases, hemodynamic measurements may be required (ex: cardiac outputs or wedge pressures) Baseline electrophysiologic events are recorded and measured - sinus node function, refractory periods, AV conduction (His-Bundle Study), intraatrial conduction and intraventricular conduction. Incremental pacing and programmed extra stimuli are done to evaluate the patient's response. Induced arrhythmias are studied closely for their origin, mechanism and management. The procedure can last from one to four hours. The duration of the admission depends on the arrhythmia induced and selected treatment modality. The inpatient stay ranges from three to fourteen days. Outpatient follow-up may be required.

C. Signed informed consent for the procedure and the appropriate signed consent for any research protocol to be done shall be obtained.
I. POLICY/PROCEDURE PURPOSE AND MECHANISMS (Cont'd)

D. Indications

1. Supraventricular arrhythmias (SV)
   a. mechanism
   b. associated with severe symptoms
   c. atrial fibrillation with WPW
   d. refractory SVT
   e. pre-excitation syndromes, symptomatic
   f. post operative congenital heart disease

2. Wide complex tachycardias
   a. mechanism/origin (SV or V)
   b. post operative congenital heart disease

3. Ventricular arrhythmias (V)
   a. mechanism
   b. associated with severe symptoms
   c. prediction of treatment efficacy
   d. EPS mapping for surgery
   e. post operative congenital heart disease

4. Evaluation for pacemaker implant
   a. symptomatic brady-arrhythmias
   b. sick sinus syndrome (SSS)
   c. AV blocks
   d. bundle branch blocks

5. Survivors of out of hospital cardiac arrests (Sudden Death)

6. Syncope

7. Evaluation of Treatment Modalities
   a. drugs (marketed agents and investigational)
   b. surgery - endocardial resection
   c. catheter ablation
   d. antitachycardia devices
   e. implantable defibrillators (investigation 4/85)
   f. cardiac pacemakers - single and dual chamber devices
II. POLICY/PROCEDURE STATEMENT AND STANDARDS

Any physician may order a consult with the Cardiac Electrophysiology service. The referral should include significant cardiac history, arrhythmia history, previous and current treatment programs and symptomatology. Consult forms are available on the units.

III. CONTRAINDICATIONS/PRECAUTIONS

A. Contraindications
   - No venous or arterial access
   - Fever, unexplained
   - Acute febrile illness

B. Precautions
   1. Unstable angina
      - Uncontrolled severe heart failure
      - Bleeding disorder
      - Uncooperative patient
      - Severe peripheral vascular disease
      - Cyanotic heart disease

   2. Coagulation studies prior to procedure at the discretion of the attending physician (PT/PTT) (adults only)
      - Electrolytes prior to the procedure at the discretion of the attending physician (adults only)
      - Monitored bed for acute life threatening arrhythmias

C. Risks/Complications

Depends on the site of entry, but may include:
- thrombophlebitis
- systemic emboli
- perforations
- tamponade
- infections
- bleeding
- pneumothorax
- myocardial infarction (LV entry)
- transient/or intermittent arrhythmias
III. CONTRAINDICATIONS/PRECAUTIONS (Cont'd)

- (1) RBBB
- (2) ectopy
- death
- pulse diminution or loss (arterial catheter)
- venous stasis

Defibrillation of the patient may be required during the procedure if specific arrhythmias are induced.

IV. EQUIPMENT/SUPPLIES

electrode catheters - 2 to 12 electrodes (Peds: 2-12 electrodes on Pediatric catheters)
hemodynamic catheters
junction box
multichannel EKG amplifier/recorder
stimulator
synchronizer
oscilloscope
constant current source
tape recorder
slave scope
cine/fluoroscopy
defibrillator
heat lamp (for infants)

V. PREPARATION OF THE PATIENT

Please see Exhibits 2 and 3.

VI. PROCEDURE ACTIONS

Appropriate referral to the Cardiac Electrophysiology service.

VII. AFTER CARE OF THE PATIENT

Please see Exhibits 2 and 3.
VIII. MEDICAL RECORD DOCUMENTATION

A. Consult note recorded.
B. Preliminary EPS report followed by the final report.
C. Copy of letter sent to the referring physician.

IX. INTERPRETATIONS

The results shall be interpreted by the electrophysiologist performing the study.

X. DEFINITIONS

None

XI. DIRECTIVES

None

XII. EXHIBITS

1. Cardiac catheterization suite for the electrophysiological study.
2. Preparation and Aftercare of the Adult Patient
3. Preparation and Aftercare of the Pediatric Patient

XIII. REFERENCES


XIII. REFERENCES (Cont'd)


<table>
<thead>
<tr>
<th>Chapter</th>
<th>Section</th>
<th>Subject</th>
</tr>
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<td>035 Cardiac Electrophysiology - Adult &amp; Pediatric</td>
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**XIV. AUTHOR/CONSULTANT**

- Fred Morady, MD  
  Director EPS Service  
  Cardiology Division  

- Lorenzo DiCarlo, MD  
  Assoc. Director EPS Service  
  Cardiology Division  

- Lois Schurig, RN, CCRN, BSN  
  Clinical Care Coordinator  
  EPS/Pacemaker  

- Macdonald Dick, MD  
  Assoc. Professor  
  Pediatric Cardiology
Figure EPS1. The cardiac catheterization suite for the electrophysiological study.

Procedure Personnel:
- Electrophysiologist
- Cardiac Fellow
- 2 EPS Technicians

Scope
- SLAVE
- X-RAY (CINE)

Equipment:
- MULTICHANNEL AMPLIFIER/RECORDER
- STIMULATOR CURRENT JUNCTION BOX
- TAPE RECORDER
I. POLICY/PROCEDURE PURPOSE AND MECHANISMS

To establish an approved procedure whereby tests requiring repetitive blood sampling can be carried out utilizing an indwelling needle with attached plastic tubing, inserted by a laboratory technologist or registered nurse, tubing to be kept patent by installation of dilute heparin by the technologist or nurse.

II. POLICY/PROCEDURE STATEMENT AND STANDARDS

The above procedure can be carried out by laboratory technologist or R.N.'s who have received training in the above procedures and precautions, and who have been personally supervised and certified proficient by a senior laboratory technologist or nursing staff person. This procedure can also be carried out by a physician's assistant.

III. INDICATIONS/PRECAUTIONS

A. Insertion of needle to be performed by laboratory technologist or R.N. only after he/she has obtained adequate training in venipuncture, including maintenance of sterility, proper arm support, etc.

B. Person must be trained in the precautions to be taken concerning administration of drugs to humans (careful triple-checking of label; avoidance of air injection, etc.).

C. Person must be trained always to discard 1.0 ml "blood and dilute heparin solution" before withdrawing sample (into another syringe).

D. Person must be reliable as regards handling and labelling of multiple specimens, especially if procedure is to be performed on more than one subject at one time (as can be done feasibly with a reliable person). Label should include subject's name, registration number, date and time.

IV. EQUIPMENT/SUPPLIES

A. Butterfly catheter or equivalent
B. Arm board
C. Series of sterile syringes of appropriate sizes
D. Tourniquet
E. Alcohol sponges (70% isopropyl alcohol)
F. Non-allergenic adhesive tape; bandaids
IV. EQUIPMENT/SUPPLIES Con't.

G. Two elastic bands (for holding tuberculin syringe in place)
H. Test tubes
I. Test tube rack
J. Appropriate labels
K. Chair, table (or arm rest) and bed (to be available if needed) for patient
L. Materials for treatment of syncopal episodes (aromatic spirits of ammonia, etc.)
M. Dilute heparin, e.g., 10-100 units/ml
N. Tuberculin syringes for accurate measurement and injection of dilute heparin solution.

V. PREPARATION OF THE PATIENT

A. Patient's forearm vein is prepared in usual fashion for venipuncture, with 70% isopropyl alcohol.
B. With tourniquet in place, a large forearm vein is entered (preferably not a vein at the antecubital crease, since one usually wishes the arm to be positioned comfortably for several hours). Needle is carefully placed, fully within vein, and good flow of venous blood assured.
C. Needle is carefully taped in place, usually with a small pledget of cotton beneath "butterfly" to insure proper angulation.
D. With a syringe attached, tourniquet is then released. First sample of blood is withdrawn and placed in proper tube; tube must be delivered immediately to Main Hospital Chemical Pathology Laboratory.
E. This syringe* is kept (sterile) for procedure "H" below.
F. 1.0 ml tuberculin syringe filled with dilute heparin solution is attached to tubing, and 0.8 ml heparin solution injected.
G. With tuberculin syringe still attached, syringe is held attached to forearm by two elastic bands.

*H. At next appropriate timepoint, using previous syringe*, 1.0 ml "blood and dilute heparin solution" is withdrawn, and this syringe and its contents are discarded. A new sterile syringe of appropriate volume is attached, and appropriate volume of blood withdrawn.
I. Repeat procedure "D", et. seq.
VI. PROCEDURE ACTIONS

See "VI." for glucose tolerance testing. Whole blood is obtained, in 1 ml red-top tubes (without anticoagulant), and, after appropriate charge cards have been made, sent to Main Hospital Chemical Pathology Laboratory. Each such specimen obtained should be delivered, immediately to this lab, with request made for prompt handling. (Serum must be promptly separated from RBC; otherwise, continuing glycolysis will give falsely low serum glucose levels.)

VII. AFTER CARE OF THE PATIENT

A. During the tolerance test, the patient is usually allowed to remain seated. Patients experiencing symptoms can be allowed to lie in a semi-recumbent fashion, with head and thorax at 30° elevation to permit adequate gastric emptying. If patient become syncopal, head should be lowered and feet elevated somewhat.

B. In the usual case, the only after-care will involve removal of the needle at the termination of the test, application of pressure for about two minutes, and application of Bandaid.

VIII. MEDICAL RECORD DOCUMENTATION

Record as usual when ordering or reporting a diagnostic procedure.

IX. INTERPRETATIONS

Appropriate to test being conducted. See "Glucose Tolerance Test" for these criteria.

IDENTIFICATION OF PHYSICIAN RESPONSIBLE:

A. The physician ordering the study has overall responsibility for the procedure in the given patient. He or she should ascertain the date and place of the performance of the procedure and make known to the laboratory technologist or R.N. his/her whereabouts, being readily available by telephone. However, his/her presence during the test is not required in the usual situation. He/she may be called should difficulty be encountered with placement of the initial needle-tubing, or if the patient experiences adverse reactions.

B. The senior laboratory person, or nursing staff person responsible for the laboratory technologist or R.N. performing the test would be responsible for assuring that those individuals performing the test have received adequate training, and have been certified as proficient.
X. DEFINITIONS

None.

XI. DIRECTIVES

None.

XII. EXHIBITS

Antecubital crease

21 gauge butterfly, in forearm vein *

alcohol "sponge" pledget**

21 gauge butterfly, e.g. Abbott No. 4492

elastic band, to hold tubing secure

dilute heparin solution, 100 U/ml

tuberculin syringe, 1.0 ml
e.g. B-D No. 5602

elastic band, to hold syringe

*If antecubital vein must be used, arm should be positioned on an arm board, to prevent flexion at elbow during test

** Non-allergenic adhesive tape (1-inch wide "Dermiclear" is preferable) applied over pledget and butterfly; another piece over "Z-loop" in plastic tubing (before applying elastic band) to prevent dislodgment of cannula.

A Band-aid is applied over skin entry-point.

XIII. REFERENCES

None.

XIV. AUTHOR/CONSULTANT

David R. Bassett, M.D.
Director, Hyperlipidemia Program
Hypertension Division, Internal Medicine
I. PURPOSE AND INDICATIONS.

A. To ensure safe patient care and uniform nursing management of the critically ill neurosurgical patient requiring external ventricular drainage.

B. External ventricular drainage is used in the intensive care unit as a means of managing increased intracranial pressure. This system provides both a means of monitoring intracranial pressure and a means for continuous or intermittent cerebral spinal fluid drainage. The ventricular drain also provides access for collection of CSF specimens for various tests and analysis.

II. POLICY.

A. Nurses in the Intensive Care Units require knowledge of and competency in the following:

1. Assisting with insertion of external ventricular drainage system.
2. Maintenance of external ventricular drainage system.
3. Transporting patients with an external drainage system.
4. Assisting with discontinuing external ventricular drainage.

B. Catheters will be inserted and discontinued by the surgeon.

C. All CSF specimens will be drawn by M.D.

III. PRECAUTIONS.

A. As with all invasive monitoring devices, strict sterility of the entire system must be maintained.

B. Criteria for drainage are ordered by the physician. If not specified in the M.D. orders, contact the physician in order to determine whether drainage is to be continuous or intermittent, the level at which drainage is to occur, and the pressure at which to initiate drainage.

C. Only M.D. may aspirate from ventricular catheter.
IV. A. Equipment for Intracranial Pressure Transducer Set-up:

- Pressure monitor
- Pressure Cable (monitor-specific equipment)
- Transducer and sterile dome
- 2 stopcocks
- 1 triple stopcock manifold
- 1 moveable IV pole
- 1 cc TB syringe
- CVP manometer
- Pressure tubing
- 250 cc NS IV bag (without preservative)
- Male adapter
- Non-vented mini drip IV tubing
- Sterile white cap (dead-ender)

B. Equipment for monitoring Set-up:

1. ICP insertion sterile tray
2. Hand punch drill
3. Safety razor
4. Iodophore solution for prep
5. Gloves, gown (surgeon); 2 masks (M.D. and R.N.)
6. Sterile basins
7. Transfer pack
8. Sterile suction tubing and connector to attach tubing to "dirty" suction set at bedside.
9. 21 or 14 French whistle tip suction catheter
10. Sterile plastic steri-drape
11. 16 or 18 gauge needle (to poke through dura)
12. 3 luer lock stopcocks
13. 3 white caps
14. Suture material (usually 2-0 silk)
15. Transducer and monitor set-up
16. Dressing material: Iodophore ointment, trach pants, 4X4's, Kerlix X2, tape
17. Holter ventricular catheter (or whatever the surgeon prefers)
18. Nonvent IV tubing (mini or maxi drip)

V. Patient and/or Significant Other Instruction.

A. Explain why drain is being inserted and the need for the patient to be properly positioned. Also explain to patient that he may be asked to deep breathe as required to control his ICP.
B. If done at the bedside, explain that a small area of the head will be shaved.

VI. PROCEDURE

A. Transducer Set-up (See Intra Cranial Pressure Monitoring Policy #63-003-012)

1. Attach mini drip IV tubing to IV bag, flush slowly to prevent air bubbles from accumulating, connect tubing to center part of triple stopcock manifold.

2. Flush other two parts of manifold with NS.

3. Attach steridome and transducer to manifold and flush steridome.

4. Attach CVP manometer distal to transducer with a stopcock attached and TB syringe proximal to transducer and flush both with NS.

5. Attach male adapter to triple stopcock manifold, connect pressure tubing and flush.

6. Shut off IV tubing and label normal saline bag "NOT FOR INFUSION". Hang IV bag on a pole that is lower than the patient's head.

7. Attach pressure cable to transducer. Place all stopcocks to open a continuous open line between the transducer and the patient's head.

8. BEFORE ZERO BALANCING THE TRANSUDER BE SURE THAT THE PART OF THE STOPCOCK ON THE TRANSUDER THAT WILL BE OPEN TO AIR IS AT THE ZERO LEVEL OF THE CVP MANOMETER.

B. Position patient with head of bed elevated, head in neutral position.

C. Insertion of External Ventricular Drainage System:

1. The catheter is inserted by the surgeon into either the left or right lateral ventricle (usually the non-dominant side). Depending on type of ventricular catheter used, a 16 gauge angiocath or blunt needle may be needed to attach the catheter to a 3-way leur lock stopcock.

2. Attach one port of the stopcock to the ICP monitor and the other port to the IV tubing and transfer pack.
3. Stabilize the stopcock and connection site to the catheter by using a tongue blade and taping the connections securely to it.

4. A patient having an external drainage catheter placed in the operating room will have the leur lock stopcock already attached to the catheter.

5. Attach the ICP monitor to the stopcock.

6. Clear the stopcock of air by flushing it with saline from the ICP set-up while the stopcock is closed off to the ventricular catheter.

7. Then, to flush all air from the connection, turn off the stopcock to the ICP monitor until just a drop of CSF flows from the ventricular catheter out the open port of the stopcock.

8. Open the stopcock between the ventricular catheter and the ICP monitor and attach the IV tubing and transfer pack to the remaining port on the stopcock.

9. Then zero-balance the transducer as explained in the Intracranial Pressure Transducer Set-up Policy. (#63-003-012)

10. Check M.D. orders for ICP and drainage parameters, as well as whether drainage is to be continuous or intermittent.

11. Check ICP reading at least every hour or as ordered by M.D. whether drainage is to be continuous or intermittent.

B. Maintenance of External Ventricular Drainage System:

1. Elevate the patient's head 30° or per M.D. orders; (this may differ for individual patients).

2. Maintain the transducer at zero balance so that the fluid level in the port open to air is level with the zero point on the water manometer. Keep patient's 4th ventricle level with this zero point at all times. (See Exhibit A)

3. Continuous drainage:
   a. Turn off stopcock to the monitor - therefore no waveform or digital ICP reading is on the monitor.
   b. Maintain drainage system at height ordered by M.D. (i.e. level with 4th ventricle, 10 cms. above ventricle, etc.).
   c. Place transducer stand under mattress on the side of the bed at patient's head level.
d. Tape CVP manometer to stand with zero point at level of patient's 4th ventricle (tragus cartilage). The 4th ventricle is in line with the patient's ear canal or tragus cartilage.

e. Tape transfer pack and IV tubing to stand with drip chamber taped so that the point at which the drop forms (air/fluid interface) is at the height ordered by the M.D. (eg. level with the 4th ventricle = 0; 10 cms above the 4th ventricle - 10 on manometer).

f. Reposition patient and/or transducer stand as needed so that zero point is always even with patient's 4th ventricle.

g. Check ICP electronically every hour and prn by closing stopcock to drainage bag and opening to monitor.

h. Report ICP which exceeds limits set by M.D. and institute further treatment per M.D. order.

i. Ventriculostomy to continuous drainage should not remain closed for prolonged periods without M.D. order.

j. Patient on continuous drainage may be on a regime of progressive elevation of the drainage system. Chart this level as changes occur.

3. Intermittent Drainage:
   a. Ventricle is open to monitor at all times, unless ICP exceeds limits set by M.D.
   b. When ICP exceeds this limit, open ventriculostomy to drainage for 10 seconds and recheck ICP. Continue drainage for 10 second periods until ICP reaches 1/2 the pressure at which drainage is initiated.

4. Trouble-shooting:
   a. Whether patient is on continuous or intermittent drainage, if at any time CSF does not flow when open to the drainage system, perform patency check as outlined in ICP monitor patency check policy.
   b. If still no flow of CSF, perform monitor irrigation as outlined in ICP monitor irrigation policy.
   c. If still no flow, notify M.D. immediately.
   d. Do not aspirate from ventricular catheter for any reason - all specimens are to be obtained by M.D.

5. Maintenance of drainage system:
   a. Change drainage bags (transfer packs) every 12 hours and any time drainage bag is more than 1/2 full.
   b. Do not change IV tubing.
   c. At no time is iodophore or other antimicrobial solution to be used on any connection sites in the system.
C. Transporting Patient with an External Ventricular Drainage System

1. Patient with continuous ventricular drainage who must be transported to a specific test or to the O.R. may remain on continuous drainage, however extreme caution must be taken in order to maintain proper level and patency of the system.

2. As a safety measure, it is advisable to turn the stopcock off to the drainage system when moving the patient from bed to stretcher and then re-establish drainage once patient is positioned.

3. M.D. must decide whether to leave ventricle clamped or to open it, and specify drainage from a specific height if patients are on intermittent drainage and are not being monitored for ICP during transport.

D. Discontinuing External Ventricular Drainage System.

1. The ventricular catheter is removed by the M.D. using sterile technique and the wound is sutured.

2. After the catheter has been discontinued, observe wound for signs of CSF leak.

3. If clear drainage is present, check it with test tape for presence of glucose. If test tape is positive for glucose it is most likely CSF. If this should occur, apply a sterile dressing to wound site, keep head of bed elevated 30-45% and notify M.D..

VII. CONTINUING NURSING CARE.

A. Zero balance transducer every hour and with every change in position of the patient as explained in the ICP Transducer Set-up Policy.

B. Maintain patient in proper position – HOB elevated as ordered, head in neutral position at all times.

C. Change drainage bag every 12° and when more than 1/2 full.

VIII. DOCUMENTATION.

A. Record amount, color, and characteristics of CSF on flow sheet every shift and when bag is changed.

B. Patient tolerance.
C. Date and time of insertion and discontinuation.

IX-XII. NOT APPLICABLE.

XIII. RESOURCES.


XIV. AUTHOR/CONSULTANT.

A. Authors: Annette Cole, RN, NICU
Mary Jo Kocan, RN, NICU
Reviewer: Patricia Murray, RN, Head Nurse NICU

B. Consultants: Julian T. Hoff, M.D.,
Title: Professor and Section Head
Department: Neurosurgery - University of Michigan
Al Lawson
Title: Biomedical Engineer, University of Michigan Hospitals
Exhibit A

Position of Manometer and 4th. Ventricle
**PURPOSE.**

To deliver prescribed solutions directly to a tumor (or specific body area via its arterial supply).

**POLICY.**

A. A physician or a Registered Nurse who has been trained and approved supplies and applies a one-way valve if there is not already one in place.

B. A physician must write the order for:

1. the amount and flow rate of the I.V. solution
2. the activity level of the patient based upon the line placement.

C. Notify the physician or her designee* of any complications or management problems that arise. Only Registered nurses who have had specific orientation to the management of arterial lines may irrigate arterial infusion catheters or purge the line.

D. Only certified chemotherapy Registered nurses may "push" antineoplastic agents through arterial lines.

**PRECAUTIONS.**

A. Luer-lock and/or tape all connections.

B. Be sure there is a one-way valve attached to the arterial line to prevent clotting at the catheter tip caused by back flow of blood.

C. Keep the system free of air bubbles.

D. Maintain sterile technique when the system is manipulated.

E. All arterial lines must be regulated by a continuous flow pump (IVAC 530, or 630; IMED 922).

F. If the IMED or IVAC alarms, the possible reasons may be:

1. Line Problem
   1. air in line

*see II.A.
2. too much resistance in fluid path (tubing pinched or kinked)
3. empty fluid chamber
4. line clotted off

2. Mechanical Problems
5. battery too low or machine unplugged
6. inappropriate machine
7. not reset
8. infusion completed

Call the physician or trained designee for unresolved problems.

G. If the infusion runs dry and there are no further orders, hang normal saline to run at 10ml/hr and contact a physician immediately.

H. Adriamycin and Heparin are incompatible, causing a precipitate to form (Haskell, C.M., et al, 1974). There may be some Heparin in the arterial catheter, post placement in angiography or operating room, which must be flushed with 20ml of normal saline prior to administration of any Adriamycin.

I. When a patient gets up, walks around or changes position, he should be cautioned to watch for disconnections.

J. Do not use scissors anywhere near the insertion site of the catheter.

K. Use the rubber tipped hemostat only if there is hemorrhaging from the line.

IV. EQUIPMENT.

Accuset (or cassette)
I.V. tubing with luer-locked extension tubing
IVAC 530, (blue) (use IVAC 630 or IMED 922 only if IVAC 530 is not available)
One-way valve: supplied by physician or Surgery Oncology Nurse Clinician
(Page #168) or Protocol Nurse (Page #1316)
Appropriate I.V. solution
Rubber tipped hemostat at bedside
Dressing change equipment (see NPM 101A) General Guidelines for I.V. Dressing Change.

V. PATIENT INSTRUCTIONS.

A. Explain: 1. Purpose of infusion pump and basics of how it works.
   2. Prescribed activity level, if the physician has so ordered.
   3. What to do if disconnection occurs
      a. get in bed, lie down
      b. call nurse immediately

B. Instruct the patient to report any changes such as:
   1. Oozing around the infusion site (wet dressings).
   2. Pain or other symptoms of phlebitis.
   3. If the IMed or IVAC alarms.
   4. Symptoms of sudden nausea, abdominal cramping

VI. PROCEDURE.  

A. Infuse the entire volume ordered over the time indicated.

B. Set pump to infuse the volume over the prescribed time.

C. Monitor the infusion closely so that the infusion is kept on schedule.

RATIONALE

A. To assure full dose is administered flush the I.V. tubing with appropriate solution.

B. For chemotherapy solutions: the actual volume in the bag of solution varies with the amount of diluent added to drug when it is dissolved. Therefore, it may be necessary to increase the rate to infuse the volume by the prescribed time.

C. If the infusion is not going to finish on time contact the physician before increasing the rate.
ARTERIAL INFUSIONS FOR TUMOR THERAPY

II. Tape all connections securely.

E. If the line should be accidently pulled out:
   1. Apply pressure
   2. Put the patient to bed
   3. Page physician stat
   4. Monitor vital signs

F. To change the I.V. solution bag:
   1. Check the drug and dosage of the admixture against the physicians order.
   2. Check the name, I.D. registration numbers of the patient on the label of the admixture against the patient's wristband.

1. Rate depends on:
   a. the drug itself and its half-life
   b. the amount that is left and the condition of the patient
   c. the total time that the drug has been infusing, related to half-life of the drug

II. Prevents disconnections and/or leaks.

E. Arterial bleeding is likely.
   1. Prevents hemorrhaging at exit site.
   2. Reduces rate of bleeding.
   3. Physician needs to assess internal hemorrhaging which may require return to O.R. for repair of arterial damage.
   4. Patient may be hemorrhaging internally.

F. 1. Correct drug and dose
   2. Make sure you have the correct patient.
3. Hang the bag as for any I.V. solution

H. Change the cassette in the IVAC or IMed daily. Note the date changed on the I.V. line.

I. Change the tubing from I.V. bag to one-way valve when other I.V. tubing is changed for infusion pumps.

J. Reset the pump at the necessary rate.

K. Be sure to check the dressing for moisture and question the patient for any changes, e.g. pain at the insertion site, at least every shift.

VII. CONTINUED NURSING CARE.

A. Normal post-op care for patients with surgically implanted catheters.

B. For patients with catheters placed in angiography follow the post angio procedure.

1. Assess dressing, peripheral vascular status and administration system every 30 minutes X 4 when patient initially returns from angiography. Then every 2 hours X 3, and every 4 hours throughout infusion.

H. Decrease the risk of infection.

I. a. the one-way valve is totally occlusive. DO NOT CLAMP the catheter with the rubber tipped hemostat.

b. general nursing staff should change tubing from bag to one-way valve only. They should not change tubing (if any) from valve to externalized catheter.

J. See "C" above.

K. To insure that the system is intact after manipulation.

B. 1. Check for bleeding, early phlebitis 2° to angio procedure and patency of new line set-up.
2. Monitor TPR and BP every 30 minutes X 4 when patient initially returns from angiography, then every two hours X 3, then every 4 hours throughout the infusion.

C. Monitor patient's temperature at least once a shift. Notify MD if T 101°F.

D. Change the sterile (occlusive) dressing over catheter insertion site daily or if using op-site every 3-5 days or PRN following the procedure outlined in the Nursing Practice Manual for these dressings (NPM 101A).

1. During the dressing change:
   a. Check the catheter site for any inflammation, induration, bleeding and/or leakage around the insertion site and report changes to the physician.
   b. Check to make sure the sutures are intact.

E. NOTE: All catheters placed by angiography are to have a separate, stabilizing dressing placed by angiography that should not be removed until catheter is to be removed.

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2. Early signs of possible internal hemorrhaging 2° to angi procedure or possible allergic reaction to angio dye.

C. These patients should be considered to continuously be at risk of catheter-induced infection.

D. Minimize risk of infection. Monitor integrity of system to ensure therapy.

E. Catheter tip is placed under angiography in order to position specifically to perfuse entire tumor bearing area. If catheter tip position is changed (pulling on line) regional treatment benefit is lost and could further result in serious side effects, depending on its new position (i.e. perfusion to aorta.)
F. If change in catheter tip position is suspected while administering chemotherapy drugs (nausea, vomiting abdominal distress) discontinue chemotherapy, hang D5W and N/S and report to M.D. immediately.

G. After the final infusion, the catheters are removed by the physician and pressure is placed on the artery for a minimum of 15 minutes. Apply a pressure dressing if directed by the physician.

Check vital signs and the dressing - every 15 minutes for 1 hour (X 4); every 30 minutes for 1 hour (X 2); every 1 hour X 4

VIII. DOCUMENTATION.

A. Record volume infused per 8 hour shift on the I&O sheet.

B. Report and document any new or unusual symptoms in the patient such as tenderness or erythema at insertion site; edema, numbness or paresthesias of extremity; sudden nausea, vomiting or abdominal cramping; pain; or change in vital signs.

IX-XII. RESOURCES.

Nursing Staff: 9 North (4-2241), CRC (4-3248)
Dr. William Ensminger (3-5939)
Protocol Nurse - Chemotherapy office - (4-4407)
Surgery Oncology Nurse Clinician (Page #168)

XIV. AUTHOR/REVIEWER: Phyllis Patterson, R.N., M.S.
TITLE: Clinical Nurse Specialist
CLINICAL AREA: Hematology: 9N
CONSULTANT: Dr. William Ensminger
TITLE: Associate Professor Internal Medicine
DEPARTMENT: Hematology/Oncology
I. Indications/Contraindications.

A. Indications.
   1. Retained secretions.
   2. Extensive or progressive atelectasis.
   3. COPD with excessive pulmonary secretions.
   4. Cystic fibrosis.
   5. Pre- and post-operative secretion control.
   6. Aspiration of vomitus or any foreign matter.
   7. Lung abscess.

B. Contraindications to any postural drainage positioning.
   1. Recent PVCs or other dangerous arrhythmias.
   2. Increased cyanosis, exhaustion, patient becoming very apprehensive and/or short of breath.

C. Additional Contraindications to the six head-down positions.
   1. Post-operative esophagogastrectomy or colon interposition patients.
   2. Increased intercranial pressure.
   3. Recent MI (within 48 hours).
   4. Immediately after eating (including tube feeding).

D. Contraindications to percussion.
   1. Increased pain and splinting.
   2. Fractured ribs.
POSTURAL DRAINAGE

3. Flail chest.

4. Hemoptysis.

II. Policy (varies from unit to unit).

A. A physician must write an order if nursing is to provide postural drainage.

B. A physician must write a referral to Chest Physical Therapy if a therapist is to provide postural drainage.

C. If Physical Therapy is accepting TX, it should be accountable.

III. Precautions.

A. Use appropriate isolation measures if patient has a communicable disease.

B. Precautions to be considered when using the six head-down positions.

1. Pulmonary embolus.

2. Unconscious patient with head trauma.

3. Recent CVA.

4. Recent cardiac surgery.

5. Cerebral edema (or general increased intracranial pressure).


7. Unstable vital signs.

8. Increased abdominal pressure.


10. Uncontrolled hypertension.

11. Orthopnea with edema and pooling in the lower extremities.

C. Precautions to percussion.

1. Osteoporosis.

2. Coagulation disorders.

3. Cancer (lung and/or chest wall).
POSTURAL DRAINAGE

4. Convulsive disorders.
5. Uncontrolled TB.

IV. Equipment.

- Adjustable bed
- Sputum jar
- Kleenex
- Any oxygen equipment the patient is utilizing
- Suctioning equipment if the patient is unable to cough and clear his secretions

V. Patient Instruction.

A. The patient should be instructed to practice his deep breathing exercises throughout the entire postural drainage treatment (please see procedural sheets pertaining to deep breathing and coughing exercises).

VI. Procedure.

A. Position the patient comfortably and auscultate his chest.

B. Assist the patient in assuming each of the drainage positions to be used (usually all 12 drainage positions are not necessary except possibly with cystic fibrosis children). The lung segments that require drainage should be determined by the physician and/or the physical therapist.

C. Each drainage position is maintained for 5 to 20 minutes depending upon the patient's tolerance, the viscosity of the patient's secretions, and the number of positions being used.

D. The patient should practice deep, repeated coughing following each drainage position, while still in the position; at the end of the treatment the patient should be placed in a sitting position to practice his coughing again.

E. Place all expectorated sputum and/or mucus in a sputum jar so that the amount, color, and consistency may be noted.

F. If the patient is unable to cough, suctioning should be performed to stimulate a cough reflex and clear the patient's bronchial secretions.
POSTURAL DRAINAGE

G. Adjunctive measures.

1. Patients receiving postural drainage are often receiving IPPB treatments.
   a. If this applies to your patient, have the IPPB treatment immediately precede the postural drainage treatment.
   b. The same policy applies to NMT and USN treatments.

2. Percussion: A technique often used with postural drainage to assist the patient in clearing his secretions.
   a. It is performed with a cupped hand (or finger for small infants).

   b. Put the tip of your thumb at the side of the middle joint of the index finger.
   c. Be sure that your fingers are straight and that there is no space between your thumb and index finger.
   d. Do NOT slap the patient.
      (1) Percussion should be done in a steady, smooth rhythm, keeping the arms and shoulders relaxed.
      (2) At ALL times, percussion should be comfortable for the patient.
      (3) You are not knocking the secretions out of the patient's chest.
   e. Percussion creates turbulence in the bronchi and bronchioles which in turn moves the secretions toward the carina so that the patient can cough them out.
   f. If your percussion is painful the patient will splint his chest wall and decreased aeration of the lung segment will result; this GREATLY if not TOTALLY reduces the effectiveness of the postural drainage treatment.
   g. Do not percuss directly on bare skin.

3. Percussion areas for each postural drainage position (note arrows delineating these areas on the positioning diagrams).
      (1) Directly under the collar bones.
      (2) Above the shoulder blade; let your fingers curve over the top of the shoulder.
   b. Position 2: directly over the shoulder blade.
   c. Position 3: directly over the shoulder blade.
   d. Position 4: directly over the nipple or just above the breast.
UPPER LOBE: a) APICAL SEGMENT (anterior)
b) APICAL SEGMENT (posterior)

LEFT UPPER LOBE: POSTERIOR SEGMENT

RIGHT UPPER LOBE: POSTERIOR SEGMENT

UPPER LOBES: POSTERIOR BASAL SEGMENTS

45° Inclination

LOWER LOBES: ANTERIOR BASAL SEGMENT

LOWER LOBES: APICAL SEGMENTS

LOWER LOBE: LATERAL BASAL SEGMENT
a) Roll to the left for right lower lobe
b) Roll to the right for left lower lobe

1. "Roll to the right side for LINGULAR PROCESS"
2. "Roll to the left side for RIGHT MIDDLE LOBE"

3. 45° Inclination

4. 45° Inclination
UPPER LOBES
ANTERIOR SEGMENTS

UPPER Lobe
APICAL SEGMENT
(POSTERIOR)

45°

RIGHT UPPER
LOBE
POSTERIOR SEGMENT

LOWER LOBES
APICAL SEGMENTS

LEFT UPPER
LOBE
POSTERIOR SEGMENT

UPPER LOBES
ANTERIOR

LOWER LOBES
APICAL SEGMENTS

45°
LOWER LOBES ANTERIOR SEGMENTS

LOWER LOBES POSTERIOR SEGMENTS

LOWER LOBES LATERAL SEGMENTS

LINGULA RIGHT MIDDLE LOBE (ROLL TO LEFT SIDE)

POSTURAL DRAINAGE PROGRAM FOR DATE

THERAPIST AM POSITION TIME

SPECIAL INSTRUCTIONS
POSTURAL DRAINAGE

e. Position 5: under the arm; let your fingers curve over the front of the chest.
f. Position 6: over the mid-portion of the side of the chest.
g. Position 7: from below the shoulder blade to the bottom of the ribs; not over the backbone.
h. Position 8: from below the nipple line to the bottom of the ribs; not over the stomach.
i. Position 9: directly under the shoulder blade.

VII. Continuing Nursing Care (Observation/Documentation).

A. Monitor the patient's response to the treatment.

B. Remain with the patient during the first treatment and all subsequent treatments if the patient is in any way unstable or requires assistance throughout the postural drainage treatment.

C. Documentation.

1. Note the patient's response to the treatment.

2. Note amount, color, and consistency of sputum and/or mucus raised.


VIII. Resources.

Respiratory ICU
Clinical Nursing Specialist, Pulmonary
Physical Therapy
Chest Physical Therapy

AUTHOR(S)/REVIEWER(S): Peggy Clough, R.P.T.
TITLE: Supervisor, Cardio-Pulmonary Section
CLINICAL AREA: Physical Therapy
I. POLICY/PROCEDURE PURPOSE AND MECHANISMS

To provide guidelines for delivery of prescribed IV medications and solutions via the INFUS-A-PORT a totally implanted venous and arterial catheter/port system. For diagram of port cross section (see Exhibit 1).

II. POLICY/PROCEDURE STATEMENT AND STANDARDS

A. The INFUS-A-PORT must not be entered until 24 hours after placement.

B. Only registered nurses, physician assistant (P A), and physicians specifically trained in the port procedure may initiate port use and discontinue.

C. Specific port use certification will be the responsibility of certified unit educational coordinators and listed resource personnel.

D. Only institutionally certified chemotherapy registered nurses, physicians, or trained P A may administered anti-neoplastic agents.

E. Continuous infusion is defined as an infusion which requires a stable dressing as defined in this policy.

F. For suspected anti-neoplastic drug extravasations contact the Clinical Research Unit (#4-3247) for the name of the member of Dr. Ensminger's team who is on-call. If unable to reach the on-call team member, call Dr. Ensminger's team who office at #4-5468.

G. Only Huber needles are allowed to access the system.

H. All continuous infusions must have a one-way-valve in place.

I. Use of leur-lock connections is required. Tape all connections.

J. Prior to INFUS-A-PORT entry verify port placement is either venous or arterial access.

III. CONTRAINDICATIONS/PRECAUTIONS

A. The port should not be entered if any signs of local inflammation or a fluid pocket exists. Contact a physician or listed resource personnel.

B. Only 10cc syringes or smaller are used for blood specimen withdrawal and system use. (Larger syringes cause cell lysis and potential system over pressurization).
III. CONTRAINDICATIONS/PRECAUTIONS (Cont'd)

C. For port difficulties refer to trouble shooting flow chart (see Exhibit 2).

D. For any unresolved system problem, contact listed personnel resource immediately.

E. For arterial or venous ports follow the procedures as outlined. Arterial port placement is at the lower rib attachment, venous placement is at the infraclavicular fossa.

IV. EQUIPMENT/SUPPLIES

A. IV START

1. Huber needle-bent (1)
2. Gauze 2x2 (2)
3. Steri-Strips 1/2" x 4" (1)
4. Transparent dressing (1)
5. Extension tubing (1) Leur-Lock
6. Stopcock, three-way (1)
7. One-way valve (1)
8. Filter .22 micron (1) or as appropriate
9. IV Tubing
10. IMED 960 (IVAC 530, Harvard Pump, Cormed) if required.

Diagram 1
IV. EQUIPMENT/SUPPLIES (Cont'd)

B. IV PREP

1. Povidone Swabs (3)
2. 10cc syringe with 10cc normal saline (1)
3. Sterile gloves (1)
4. Skin prep (1) (optional)

V. PREPARATION OF THE PATIENT

A. Explain:

1. Procedure to patient
2. Level of activity allowed.
3. What to do if system disconnects:
   a. Pinch tubing
   b. Return to bed or chair
   c. Call the nurse immediately

B. Instruct patient to report changes such as:

1. Blood back flow
2. Fluid leaking (oozing) around needle infusion site or in system (i.e. filter).
3. Symptoms of pain, or site swelling.
4. External infusion pump alarms.

VI. PROCEDURE ACTIONS

A. For IV Start and Continuous Infusion.

1. Gather together and connect equipment in this order. Purge system using IV solution and appropriate pump.
   a. Solution
   b. IV tubing
   c. .22 micron filter(s)
   d. One way valve
   e. Stopcock, three-way
2. Gather together remaining equipment (sterile and non-sterile)
3. Free area around port of all clothing
4. Place patient flat or reclined
5. Palpate implanted port, define center of port
6. Prep port area with 3 povidone iodine (Betadine) swabs. Use clean to dirty technique. Clean 6 cm radius around the port. Allow to dry.
7. Place to side of work area 10 cc normal saline filled syringe.
8. Establish a sterile working field
VI. PROCEDURE ACTIONS (Cont’d)

9. Place on sterile field:
   a. Huber needle
   b. Leur-Lock extension set
   c. 2x2 gauge(s)
   d. Steri-Strips
   e. Transparent dressing

10. Glove

11. Assemble needle and extension tubing, keeping equipment on the sterile field, purge system using 10 cc normal saline syringe. Note: One hand must remain sterile, purge system with hand that will not be used to enter port system.

12. Enter port at 90 degree angle with Huber needle, and continue insertion until needle stop is felt. Keep index finger at the needle bend to increase needle stability during insertion.

13. Flush system using syringe with remaining saline connected to the end of the extension set. If resistance, pain or swelling is noted at the site reposition needle. While flushing system draw back and attempt to withdraw blood; then complete flush. Note: Blood return may not always be obtainable due to catheter size, position, etc. Always verify system patency with saline flush.

14. Place 2x2 gauze under bent needle for support

15. Apply skin-prep

16. Apply Steri-strips across the needle and tubing for the initial 3 inches.

   Note: In taping, ensure that the bent needle remains at 90 degrees and no stress is applied to the needle angle. If stress exists it may result in drug back flow, decreased flow or leakage.

17. Cover area with transparent dressing.

18. Remove syringe and connect to primed IV tubing at stopcock. Begin infusion.

19. Tape all connections.

20. Monitor infusion to insure system patency as necessary, evaluate after 15 minutes, then check each hour thereafter for patency, leakage, swelling or inflammation at site.
VI. PROCEDURE ACTIONS (Cont'd)

B. Dressing change for Continuous Infusion

1. Assess insertion and dressing site of leakage, swelling, and inflammation daily.

2. Change occlusive dressing and extension tubing every 5 days leaving Huber needle in place.

3. Change IV tubing including .22 micron filter and one way valve every 48 degrees. Note: May require more frequent changes due to transfusions, chemotherapy, etc.

4. Equipment

   a. Transparent Dressing (1)
   b. Steri-Strips 1/2" x 4" (1)
   c. Skin prep (s) (optional)
   d. 2x2 gauze (1)
   e. Sterile gloves (1)
   f. Povodine Swabs (3)
   g. Saline syringe with 10cc Normal Saline (1)
   h. Detachol (liquid tape solvent)
   i. IV tubing (1)
   j. One-way valve (1)
   k. Three way stopcock
   l. .22 filter (1)

5. Stabilize IV line with 2 strips of 1" tape below the site of adhesive dressing.

6. Maintaining pressure on needle system - CAREFULLY remove transparent dressing and steri strips, without removing Huber needle.

7. Prep port area with 3 povidone iodine (Betadine) swabs. Use clean to dirty technique. Cleanse 6 cm radius around the port. Allow to dry.

8. Place to side of work area 10 cc normal saline filled syringe.

9. Establish a sterile working field.

10. Place on sterile field:
    a. Leur-Lock extension set
    b. 2x2 gauze (s)
    c. Steri-Strips
    d. Transparent Dressing
VI. PROCEDURE ACTIONS (Cont'd)

11. Glove

12. Keeping equipment on the sterile field, purge leur lock extension tubing using 10 cc normal saline syringe.

13. Attach extension tubing to Huber needle.

14. Flush system using syringe with remaining saline at the end of the extension set. If resistance, pain or swelling is noted at the site withdraw needle and assess for placement. Always verify system patency with saline flush.

15. Place 2x2 gauze under bent needle for stability.

16. Apply skin-prep to area of covering.

17. Apply Steri-strips across the needle and tubing for the initial 3 inches. Note: In taping, ensure that bent needle remains at a 90 degree angle and no stress is applied to the needle angle. If stress exists it may result in drug back flow or decreased flow or leakage.

18. Cover area with transparent dressing.

19. Remove syringe and connect to primed IV tubing at stopcock, begin infusion.

20. Tape all connections.

C. Discontinuing the Infusion

1. Following infusion completion remove transparent dressing, steri-strips, and gauze, leaving the Huber needle and extension tubing in place.

2. Turn off the infusion.

3. Disconnect IV tubing at three way stopcock closest to Huber needle.

4. Attach syringe with 10 cc heparinized saline solution (100 u/cc) to extension tubing.

5. Start to flush line with heparinized saline.

6. Stabilizing port with one hand withdraw needle as the final 1 cc is being injected. Note: This maintains positive pressure to prevent blood back flow into the catheter/port system.
VI. **PROCEDURE ACTIONS (Cont'd)**

7. Apply pressure with gauze to needle insertion site as necessary.

8. Clean skin with alcohol wipes.

VII. **AFTER CARE OF THE PATIENT**

None

VIII. **MEDICAL RECORD DOCUMENTATION**

A. Document procedure, insertion site, system patency, amount of drug, date, time and rate of infusion.

B. Record IV patency.

C. Record dressing change.

D. Record discontinuing of IV and infusion system.

E. Report and document any complications noted secondary to procedure or normal functioning of INFUS-A-PORT.

IX. **INTERPRETATIONS**

None

X. **DEFINITIONS**

None

XI. **DIRECTIVES**

None

XII. **EXHIBITS**

1. Port Cross Section
2. Trouble Shooting Flow chart

XIII. **REFERENCES**


XIII. REFERENCES (Cont'd)

The resource personnel list is provided to assist the user in identifying the initial contact person for any unresolved port/catheter problems. If the identified person is unavailable and/or if additional assistance is required, you are requested to contact Suzette Walker, R.N., University of Michigan, Infus-A-Port Study Coordinator or Clinical Research Unit (4-3247) for the name of Dr. Ensminger’s team who is on call.

Personnel

A. Suzette Walker, R.N.
   Research Clinician I
   668-5684 Ram Pager
   4-5468 Office

B. Susan Gilbertson, P.A.
   668-5652 Ram Pager
   4-5468 Office

C. Diane Hatch, R.N.
   Oncology Consult Clinician I
   4-4244 paging
   4-2290 9 North

D. Barbara Medvec, R.N.
   Assistant Head Nurse
   - Outpatient
   668-3415 Ram Pager
   4-4488 Clinic

E. Robin Siegel, R.N.
   Assistant Head Nurse - Inpatient
   4-2240 9 North

Patient Population Covered

Hepatic and Infus-A-Port Protocol Patients
Pediatric Hematology/Oncology

Hepatic and Infus-A-Port Protocol Patients

Oncology Consults
Inpatient Medical Nursing

Outpatient Clinics
Head and Neck/Esophageal Research Patients

Inpatient Hematology/Oncology Unit

XIV. AUTHOR/CONSULTANT

Suzette Walker, R.N.
Research Clinician I

Diane Hatch, R.N., B.S.N.
Oncology Consult Clinician I
XIV. AUTHOR/CONSULTANT (Cont’d)

Barbara R. Medvec, R.N., B.S.N.
Assistant Head Nurse - Outpatient
Hematology/Oncology Clinic

Robin Siegel, R.N.
Assistant Head Nurse - Inpatient
Hematology/Oncology Unit - 9 North

William D. Ensminger, M.D.
Division Hematology/Oncology
Director Upjohn Center
Complication

Trouble Shooting Port Systems

For any unresolved system/port/catheter problem immediately contact Resource Personnel or on duty personnel.

Cause/Symptom

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<td>Port Site</td>
<td>Port Site</td>
</tr>
<tr>
<td>Small Catheter lumen size</td>
<td>Small Catheter lumen size</td>
<td>Small Catheter lumen size</td>
</tr>
<tr>
<td>Inadequate needle placement</td>
<td>Inadequate needle placement</td>
<td>Inadequate needle placement</td>
</tr>
<tr>
<td>Verify catheter patency</td>
<td>Verify catheter patency</td>
<td>Verify catheter patency</td>
</tr>
<tr>
<td>Check equipment &amp; connection piece for failure</td>
<td>Check equipment &amp; connection piece for failure</td>
<td>Check equipment &amp; connection piece for failure</td>
</tr>
<tr>
<td>Stop infusion</td>
<td>Stop infusion</td>
<td>Stop infusion</td>
</tr>
<tr>
<td>Notify M.D.</td>
<td>Notify M.D.</td>
<td>Notify M.D.</td>
</tr>
</tbody>
</table>

Intervention

<table>
<thead>
<tr>
<th>Needle Placement</th>
<th>Needle Placement</th>
<th>Needle Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inappropriate needle placement</td>
<td>Inappropriate needle placement</td>
<td>Inappropriate needle placement</td>
</tr>
<tr>
<td>Verify needle placement with 3 cc normal saline flush</td>
<td>Verify needle placement with 3 cc normal saline flush</td>
<td>Verify needle placement with 3 cc normal saline flush</td>
</tr>
<tr>
<td>Reinsert port pocket</td>
<td>Reinsert port pocket</td>
<td>Reinsert port pocket</td>
</tr>
<tr>
<td>Stop infusion</td>
<td>Stop infusion</td>
<td>Stop infusion</td>
</tr>
<tr>
<td>Notify M.D.</td>
<td>Notify M.D.</td>
<td>Notify M.D.</td>
</tr>
</tbody>
</table>
I. POLICY/PROCEDURE PURPOSE AND MECHANISMS

To provide guidelines for delivery of prescribed IV medications via the INFUS-A-PORT a totally implanted venous and arterial catheter/port system. For diagram of port cross section see Exhibit 1.

II. POLICY/PROCEDURE STATEMENT AND STANDARDS

A. The INFUS-A-PORT must not be entered until 24 hours after placement.

B. Only registered nurses, physician assistant (P A), and physicians specifically trained in the port procedure may initiate port use and discontinue.

C. Specific port use certification will be the responsibility of certified unit educational coordinators and listed resource personnel.

D. Only institutionally certified chemotherapy registered nurses, physicians, or trained P A may administer anti-neoplastic agents.

E. Bolus infusion is defined as a short infusion that does not require the stability of a total dressing. See Continuous INFUS-A-PORT Policy #63-02-065.

F. For suspected antineoplastic drug extravasations contact the Clinical Research Unit (#4-3247) for the name of the member of Dr. Ensminger's team who is on-call. If unable to reach the on-call team member, call Dr. Ensminger's office at #4-5468.

G. Only Huber needles are allowed to access the system.

H. Use of leur-lock connections is required. Tape all connections.

I. Prior to INFUS-A-PORT entry verify port placement i.e. venous or arterial access.

III. CONTRAINDICATIONS/PRECAUTION

A. The port should not be entered if any signs of local inflammation or a fluid pocket exists. Contact a physician or listed resource personnel.

B. Only 10 cc syringes or smaller, are used for blood specimen withdrawal and system use. (Larger syringes cause cellysis and potential system over pressurization).

C. For port difficulties refer to trouble shooting flow chart, Exhibit 2.

D. For an inflamed port pocket or any unresolved system problem, contact listed resource personnel immediately.
IV. CONTRAINDICATIONS/PRECAUTION (Cont'd)

E. For arterial or venous ports follow the procedures outlined in policy. Arterial port placement is at the lower rib attachment, venous placement is at the infraclavicular fossa.

F. For unattended patient, needle must be stabilized.

V. EQUIPMENT/SUPPLIES

A. IV START

1. Huber needle—bent or straight (1)
2. Extension tubing (1) Leur-Lock
3. Stopcock, three-way (1)
4. Filter .22 micron (1) or as appropriate
5. IV Tubing if required
6. IMED 960 Pump (IVAC 530, Harvard Pump, Coramed) if required.

Diagram 1

B. IV PREP

1. Providone Swabs (3)
2. 10 cc syringe with 10 cc saline (1)
3. Sterile gloves (1)
4. Alcohol Sponges (2)
VI. PREPARATION OF THE PATIENT

A. Explain:
   1. Procedure to patient
   2. What to do if system disconnects:
      a. Pinch tubing
      b. Remain in bed or chair
      c. Call the nurse immediately

B. Instruct patient to report changes such as:
   1. Blood backflow
   2. Fluid leaking (oozing) around needle infusion site
   3. Symptoms of pain, site swelling
   4. External infusion pump alarms

VII. PROCEDURE ACTIONS

A. For IV Bolus Injection  Note: Either IV solution or saline syringes are optional for bolus injections.

1. Gather together equipment in this order and purge system using IV solution and/or normal saline.
   a. Solution
   b. IV tubing, if required
   c. .22 micron filter(s)
   d. Stopcock, three-way

2. Gather together remaining equipment (sterile and non-sterile)
3. Free area around port of all clothing
4. Place patient flat or reclined.
5. Palpate implanted port, define center of port
6. Prep port area with 3 povidone iodine (Betadine) swabs. Use clean to dirty technique. Cleanse 6 cm radius around the port. Allow to dry.
7. Place to side of work area 10 cc normal saline filled syringe.
8. Establish a sterile working field
9. Place on sterile field:
   a. Huber needle
   b. Leur-Loc extension set
   c. .22 micron filter
   d. Three-way stopcock
VII. PROCEDURE ACTIONS (Cont'd)

10. Glove

11. Assemble needle extension tubing, keeping equipment on the sterile field, purge system using 10 cc normal saline syringe. Note: One hand must remain sterile, purge system with hand that will not be used to enter port system.

12. Enter port at 90 degrees angle with Huber needle, and continue insertion until needle stop is felt.

13. Flush system using syringe with remaining saline at the end of the extension set. If resistance, pain or swelling is noted at the site reposition needle. While flushing system draw back and attempt to withdraw blood then complete flush. Note: blood return may not always be obtainable due to catheter size position, etc. Always verify system patency with saline flush.

14. Remove syringe and connect medication syringe.

15. Infuse bolus medication as follows:
   a. Flush system with saline.
   b. Administer first anti-neoplastic agent or medication.
   c. Flush with saline. Flush until clear. The filter may require changing if unable to be flushed clear between each agent administered. Note: complete all drug infusions in this manner.

16. Report immediately to physician any failure to infuse drug solution into port.

17. Following medication completion, leave Huber needle in place.

18. Attach syringe with 10 cc heparinized saline solution (100 u/cc) to extension tubing.

19. Start to flush line with heparinized saline.

20. Stabilizing port with one hand withdraw needle as the final 1 cc is being injected. This maintains positive pressure to prevent blood back flow into the catheter/port system.

21. Apply pressure with gauze to needle insertion site as necessary.

22. Clean skin with alcohol wipe.

VIII. AFTER CARE OF THE PATIENT

None
IX. MEDICAL RECORD DOCUMENTATION
   A. Document procedure, insertion site, system patency, amount of drug, date, time and
      rate of infusion in appropriate format.
   B. Record discontinuing of IV and infusion system.
   C. Report and document any complications noted secondary to procedure or normal
      functioning of INFUS-A-PORT.

X. INTERPRETATIONS
   None

XI. DEFINITIONS
   None

XII. DIRECTIVES
    None

XIII. EXHIBITS
   1. Port Cross Section
   2. Trouble Shooting-Flow Chart

XIV. REFERENCES

Gyves, J., Ensminger, W., Niederhuber, J., Dent, T., Walker, S., Gilbertson, S., Cozzi, E.,
Saran, P. A totally implanted injection port system for blood sampling and chemotherapy
administration. (Submitted JAMA, October, 1983).

Gyves, J., Ensminger, W., Niederhuber, J., Liepman, M., Cozzi, E., Doan, K., Dakhil, S.,
Wheeler, R. Totally implanted system for intravenous chemotherapy in patients with

Suzette Walker, R.N.
Research Clinician I

Diane Hatch, R.N., B.S.N.
Oncology Consult Clinician I
# Trouble Shooting Port Systems

For any unresolved system port/catheter problem contact resource personnel or MD immediately

<table>
<thead>
<tr>
<th>Complication</th>
<th>Cause/Symptom</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Swelling At Port Site</strong></td>
<td>1. Port Site</td>
<td>1. A. Verify needle placement with 3 cc normal saline flush</td>
</tr>
<tr>
<td></td>
<td>A. Inappropriate needle placement</td>
<td>B. Replace/reposition needle</td>
</tr>
<tr>
<td></td>
<td>B. Port system malfunction</td>
<td>C. Discontinue infusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D. Verify port system patency</td>
</tr>
<tr>
<td><strong>Extravasation (Vesicant Agent)</strong></td>
<td>2. A. Swelling, burning at port site during infusion of vesicant agents</td>
<td>2. A. Do not remove needle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B. Stop infusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. Contact M.D. and resource person immediately as noted in Policy Section</td>
</tr>
<tr>
<td><strong>Occlusion</strong></td>
<td>3. A. Port/Catheter/clot</td>
<td>3. A. Verify port patency with 3 cc normal saline flush</td>
</tr>
<tr>
<td></td>
<td>B. Port clot</td>
<td>B. Status check each equipment IV tubing &amp; connection piece for failure.</td>
</tr>
<tr>
<td></td>
<td>C. Filter or one-way valve malfunction</td>
<td>Change as needed</td>
</tr>
<tr>
<td></td>
<td>D. Infusion pump malfunction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E. Kinked IV tubing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F. Inappropriate needle placement</td>
<td></td>
</tr>
<tr>
<td><strong>Inflammation at Insertion Site</strong></td>
<td>4. A. Infected incision site</td>
<td>4. A. Assess daily for redness/drainage</td>
</tr>
<tr>
<td></td>
<td>B. Infected port pocket</td>
<td>B. Notify M.D. at onset of symptoms</td>
</tr>
<tr>
<td></td>
<td>C. Poor healing - post-op</td>
<td>C. Post-op antibiotics</td>
</tr>
<tr>
<td><strong>Inability to Withdraw Blood From Port</strong></td>
<td>5. A. Catheter/position</td>
<td>5. A. Flush with normal saline to verify patency</td>
</tr>
<tr>
<td></td>
<td>B. Small Catheter lumen size</td>
<td>B. Reposition patient</td>
</tr>
<tr>
<td></td>
<td>C. Potential fibrin sheath formation</td>
<td>C. Flush with 3-3 cc saline syringes</td>
</tr>
<tr>
<td></td>
<td>D. Port/Catheter clot</td>
<td>D. Notify M.D. and resource person if no prior blood draw difficulties are</td>
</tr>
<tr>
<td></td>
<td></td>
<td>documented</td>
</tr>
</tbody>
</table>
XIV. REFERENCES (Cont'd.)

Barbara R. Medvec, R.N., B.S.N.
Assistant Head Nurse - Outpatient
Hematology/Oncology Clinic

Robin Siegel, R.N.
Assistant Head Nurse - Inpatient
Hematology/Oncology Unit - 9 North

William D. Ensminger, M.D.
Division Hematology/Oncology
Director Upjohn Center

Resources

The resource personnel list is provided to assist the user in identifying the initial contact person for any unresolved port/catheter problems. If the identified person is unavailable and/or if additional assistance is required, you are requested to contact Suzette Walker, R.N., University of Michigan, Infus-A-Port Study Coordinator or Clinical Research Unit (4-3247) for the name of Dr. Ensminger's team who is on call.

Personnel

A. Suzette Walker, R.N.
   Research Clinician I
   668-5684 Ram Pager
   4-5468 Office

B. Susan Gilbertson, PA
   668-5652 Ram Pager
   4-5468 Office

C. Diane Hatch, R.N.
   Oncology Consult Clinician I
   4-4244 Paging
   4-2290 9 North

Patient Population Covered

Hepatic and Infus-A-Port Protocol Patients
Pediatric Hematology/Oncology
Hepatic and Infus-A-Port Protocol Patients
Oncology Consults
Inpatient Medical Nursing