An Analysis of Over-Utilization and its Effects in the Radiology Recovery/Holding Room at the University Of Michigan
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Executive Summary

The project team did an analysis of the Radiology recovery/holding room at the University Of Michigan Hospitals and Health Center. The purpose of the study was to determine if the Radiology recovery/holding room was over-utilized. Over-utilization is defined as any time when more patients were in the room than could be handled. During an initial visit to the Radiology recovery/holding room, the project team observed over-utilization with more patients in the room than the allotted 12 patient maximum capacity. From this point on in our analysis we attempted to investigate several factors:

- If over-utilization was occurring?
- What was the effect of the over-utilization?
- To what extent was the room over-utilized and what was the cause of the over-utilization?
- What were the best solutions to this over-utilization considering effectiveness and cost?

Through interviews with staff in the Radiology recovery/holding room we were able to outline some of the negative effects of over-utilization. First, we concluded that a better terminology for the over-utilization of the room was “overcrowding” and that for the purposes of our study these words would become interchangeable. This is to say that that when the room was over-utilized it was not merely a manufacturing process being pushed beyond its maximum capacity. The room could probably hold fifty people. However, the room could not comfortably hold more than 12 patients. There are only 12 bays and according to standards of phase II recovery rooms, there is an intended 1:1 ratio for bays. Past 12, patients were placed in less than optimal locations. When this occurs, the room can be more cluttered and transporting patients becomes increasingly difficult. As a result, patients may complain. One nurse revealed in an interview that a recent patient had left the Radiology recovery/holding room Against Medical Advice. The nurse also revealed that patients would complain about a lack of privacy when the room was overcrowded. Additionally, the nurse admitted that she felt there was a higher risk associated with overcrowding of the Radiology recovery/holding and patients aspirating. If this occurs and the patient is not in a bay, they aren’t close to a suction mechanism that may be required to prevent the patient from choking. The nurse felt that there was a compromise in the amount and types of care that could be administered when the room was overcrowded. Upon these interviews it was determined that there was clearly a perceived problem with the current setup and some investigation was necessary.

To determine if the room was over-utilized, the total number of patients in Radiology recovery/holding forms developed to collect this information. Instructions were given to count the number of patients every 15 minutes and to also note if any minor in-room procedure was completed. If a nurse became too busy to fill out the form, they were instructed to leave the time slot blank. Also, during the study some of the nurse staff was sick and they missed complete days. In total, 12 days were analyzed throughout the month of November. What was observed was that the room was sometimes over-utilized, but not frequently. The data showed that the room was over-utilized 6.2% or 402 minutes of the time observed. On average for all times and days, the room was less than 80% utilized approximately 61% of the time. The arguments that the room was over-utilized were substantiated. The room was not over-utilized on only one day and there was no apparent reason indicating that the over-utilization was a freak occurrence during the time of data collection.

To determine why over-utilization occurred, additional questions were asked and more data was collected. It was determined that the patients in the Radiology recovery/holding room were a combination of Inpatient and Outpatients being either prepped for or recovered from a procedure. Most of the patients in the Radiology recovery/holding room are going to one of three rooms: Angiography, CT, or Ultrasound procedure rooms. The Radiology recovery/holding room was the intermediate stage or post stage for these three procedure rooms. The room is on the receiving end of the procedures in either case. The Radiology recovery/holding room does not get to schedule when patients are prepped or when they are recovered. Patients are brought there according to the prescribed procedures in Radiology with no thoughts to how full the Radiology recovery/holding room is. A multitude of
Scheduling information was collected. Initially it was very difficult to determine how scheduling was done. Currently, there is no central scheduling between the recovery/holding room and the departments that it supports. Angiography, CT, and Ultrasound procedure rooms use their own scheduling methods. The next day’s schedule is requested daily by the Radiology recovery/holding room. These schedules are collected and compiled to forecast how busy the room will be. Ideally, this would work, but the schedules are very dynamic and nurses estimate that there is frequently up to 40% more than what is scheduled due to late additions. Eventually, the concept of trying to predict future schedules by tabulating previous procedure room schedules was dropped. It was too time intensive and as was mentioned could be largely inaccurate.

A final attempt late in our analysis was made to evaluate historical data collected by the Data Systems Manager governing over the Radiology recovery/holding room. This person provided us with data collected throughout the month of November 1999 a total of 47,000 records. This data was analyzed in an attempt to show what percent of the patients that go through the Radiology recovery/holding room continue to each of the individual procedure rooms: Angiography, CT, and Ultrasound. Also, the data was analyzed in an attempt to determine approximately how long on average a procedure in each of the three procedure rooms lasted. If the average time for a procedure was known, this information could predict average recovery/holding waiting times for patients being moved to another department. The data proved difficult to evaluate. Many of the records were lacking data. It was unfortunate that this data was gotten so late in the term as there was not enough time or resources to appropriately draw any conclusions. The project team would strongly recommend that if this analysis were taken further, this data resource should be considered.

The goal of this entire project was to analyze the Radiology recovery/holding room and suggest improvements if necessary. From our analysis, it is evident that the room is over-utilized and two main recommendations were given. First, more information needs to be collected in a more efficient manner. The data that is analyzed by the Data Systems Manager lacks key coding for the study that we conducted. Information that should be collected to analyze the Radiology department is how long patients spend in the Radiology recovery/holding room and what procedures they are scheduled to have. With more/better data, this study would become easier. Every year the number of procedures supported by Angiography, CT, and Ultrasound grows and there should be some way to track the patients that need prep work or recovery for these procedures. Additionally, more communication between the three procedure rooms and the Radiology recovery/holding would benefit the Radiology recovery/holding room. If the departments supported by recovery/holding provided more accurate schedules, the recovery/holding room could prepare for overcrowding and attempt to arrange the room accordingly.

There could be a stipulation that during the scheduling of Angiography, CT, and Ultrasound procedures a check must be made to determine if there will be space in the Radiology recovery/holding room. If not, the Radiology recovery/holding room should have the ability to put a hold on the number of patients admitted into the room. Another suggestion involves better scheduling. There is a clear trend from the data collected that early in the morning and later in the afternoon the number of patients in Radiology recovery/holding is less than during the middle of the day. If patients could be scheduled more around these times, the over-utilization times may flatten out.

Secondly, more rooms could be built supporting Radiology recovery/holding. Some consideration should be given to the overall growth of the population and the increasing number of procedures that Radiology recovery/holding supports. This option is the most expensive considered, but a cost analysis of the price of a law suit multiplied by the percent the room is over-utilized should be compared with the cost of building additional rooms. Finally, the nurses suggested a compromise in the building of new rooms by adding 1-2 bays in an adjoining room (immediately across from the Radiology recovery/holding room) which they feel could be modified. Some of these suggestions need considerable further investigation before they could realistically be implemented, but the ideas of more communication and allowing for the option of a “hold” status being announced by the Radiology recovery/holding room should be immediately considered.
Introduction and Background
The Radiology department perceives that the number of bays in the Radiology recovery/holding room currently available to service patients is inadequate. Anecdotal data suggest that during peak hours (approximately 11:30 AM until 3:30 PM) bed utilization can reach 150%. Over-utilization forces the nurses to hold overflow patients in less than optimal locations, possibly compromising patient care. Over-utilization also leads to overcrowding of the recovery/holding room, making it more difficult for the nurses to perform their necessary duties. Overcrowding also leads to patient dissatisfaction with the service they are receiving, resulting in a less than optimal review of the hospital's operations.

In an attempt to understand the problem more clearly, the Radiology department has requested the Program and Operations Analysis department to perform a study of bed utilization, and determine:
1. If there is an over-utilization problem, as suggested by the anecdotal data.
2. What is causing the over-utilization of beds in recovery/holding?
3. What would be recommended to solve the problem, if one does exist?

Involved Parties
The following parties are involved in this project:
- Department of Radiology, University of Michigan Hospitals and Health Center
  The Radiology department is commissioning this study and looking for possible solutions to its perceived problem of overcrowding
- Program and Operations Analysis Department, University of Michigan Hospitals and Health Center
  The P&OA department is using undergraduate Industrial and Operations engineering students to perform the study, under the supervision of Richard Coffey, Director of P&OA
- Industrial and Operations Engineering, College of Engineering
  The project team consists of undergraduate engineers in senior standing who are seeking degrees in Industrial and Operations engineering.

The room has two distinct sections: holding and recovery. These two sections are each divided into 6 bays, as is seen in the layout of the room located in Appendix A. A bay is an area that has space for a stretcher, providing locations for suction, oxygen and other things a patient might need while in the recovery room. Patients served by recovery/holding are a mix of scheduled patients from other departments such as Angiography (ANGIO), Computed Tomography (CT), and Ultrasound (US). In addition, patients that need emergency radiology procedures performed and are taken to recovery/holding and must be accommodated for. A flow chart of patients through the room can be seen in Appendix B.

Patients are brought to the recovery/holding room for a variety of reasons, but can be classified into two larger groups:
1. Patients requiring preparation work such as medical histories, blood work, or IV work before they receive exams or treatments in Radiology.
2. Patients who need time to fully recover from Radiology exams or treatments. For example, conscious sedation patients are awake, but unable to safely leave the recovery area without supervision. They must wait until they are able to safely leave.

Current Situation
If the recovery/holding room is over-utilized, many of the duties that the nurses are required to perform become more complicated. Over-utilization leads to compromises in patient care, and a potential lack of patient confidentiality.

Patient safety can be compromised when the recovery/holding room is past capacity. On occasion, a patient requires suction, an operation requiring a tool mounted to the back wall of a bay. In an overflow situation, if a patient located in the hall requires suction, they have to be moved into an already occupied bay to have the service performed. In addition, when there are many patients and staff in the way, nurses are restricted from performing their duties as best they can and accidents may occur. The
University Of Michigan Hospitals and Health Center – Department of Nursing set forth the Standards Of Care that explicitly state that "all patients, families, and significant others can expect an approach to treatment that is kind, respectful, preserving of dignity and mindful of cultural background". Being placed in front of a bathroom while waiting for treatment should not be considered a kind and respectful approach to treatment.

Patients in the Radiology recovery/holding room that are receiving prep work are often asked a series of questions regarding their medical history. These questions often require the patient to divulge confidential personal information; often things that other patients or strangers should not be able to overhear. When patients are placed in such close proximity, their confidentiality can be compromised. The University Of Michigan Hospitals and Health Center include in their definition of Confidential Information any "Information entrusted by the patient to an employee, trainee, student, volunteer or member of the clinical staff or any knowledge these people have regarding the patient". The definition of confidential information also includes any "Patient information collected by the University of Michigan Hospitals and Health Centers including transferred medical records, correspondence and telephone calls". Forcing patients to be held at such close quarters is a direct disregard of the confidentiality statement.

Also, overcrowding of the recovery/holding room may lead to overworked nurses, patients may become angry for having to wait so long, and client stays could be extended. All this reflects poorly on the hospital and the service it provides.

**Hypothesis Considered**
The hypothesis was that a bay over-utilization problem exists in the Radiology recovery/holding room. Over-utilization is defined as any situation where the number of patients in the Radiology recovery/holding room exceeds the number of bays available (12). If it was determined that an over-utilization problem existed, several causes for the problem would be considered.

If there is an over-utilization problem in the Radiology recovery/holding room, several causes must be considered:
- A lack in staff. Are there enough nurses to perform the required duties, are patients having to wait for a nurse to become available and is that why there is no room for patients to be stored?
- A shortage of bays available. Are there areas where more bays could be added?
- Poor scheduling or routing of patients. Do all patients in Radiology recovery/holding have to be there? Is there another area they could be treated?

**A Lack in Staff**
There are 2 Registered Nurses (RN) and 3 Licensed Practical Nurses (LPN) scheduled throughout the day as seen in Figure 1. According to the Physicians Guide to Michigan Law, the practice of nursing as a licensed practical nurse (LPN) means the practice of nursing based on less comprehensive knowledge and skill than that required of a registered professional nurse and performed under the supervision of a registered professional nurse or physician. A LPN cannot perform patient assessments independently or administer IV conscious sedation. Additionally, the guide says that a Registered Professional Nurse (RN) is an individual licensed to practice nursing. The scope of practice includes the teaching, direction, and supervision of less skilled personnel in the performance of delegated nursing activities.
According to the ASPAN (American Society of Post Anesthesia Nurses Association), for phase II recovery (like Radiology recovery) the nurse to patient ratio is 1:3. If lack of staff is the problem, the data should show a repeated over-utilization of the nursing staff.

**Shortage of available bays**
As seen in Radiology recovery/holding room layout, there are currently 12 bays, equally divided among the holding and recovery sections. According to Jacob S. Israel, MD and Thomas J. DeKornfeld, MD's book "recovery Room Care", 1.5 to 3 recovery bays are needed to support one procedure room. If this is the problem, the data should show a chronic over-utilization of the recovery/holding room. Over-utilization of bays is defined as when the total number of patients in Radiology recovery/holding exceeds 12.

**Scheduling**
Patient arrival in the Radiology recovery/holding room involves many factors. Patients can be either outpatient or inpatient and can also be scheduled for any number of procedures in the Radiology department. Patients are not scheduled for recovery/holding directly. Other departments throughout the hospital schedule patients for procedures; patients then show up at the recovery/holding room due to that schedule. One thing is certain; the Radiology recovery/holding room does not have any input into the scheduling process. Even if the recovery/holding room is full, more patients must be accommodated. At this point the hospital does not make provisions for the capacity of the recovery/holding room.

**Approach and Methodology**
The hypothesis was tackled in two-phases. First, data was collected to determine if an over-utilization problem existed. Forms were used to document the number of patients in the Radiology recovery/holding room. The nurses scheduled to work during the day filled out the forms. The data was used to determine bed utilization. A sample form is included in Appendix C.

Two data forms were filled out each day, one for holding and the other for recovery. Every 15 minutes, the designated nurse was instructed to count the number of outpatients in their side of the room, the number of inpatients in their side of the room, and note if any in-room procedures were performed during that time period. No data was collected prior to 8:00am or after 5:00pm due to the relatively low amount of patients prior to and after these times.

Nurses were informed that accurate data was more important than the amount of data received. If a nurse became too busy to record the information in a time slot, the nurse was instructed to leave that section blank rather than try to remember the numbers. This was done to ensure that all collected data was as accurate as possible. Blank time slots were encountered only a few times in the data forms and therefore was not considered to be a problem.

Data was collected from Tuesday November 2, 1999 through Tuesday November 24, 1999, excluding weekends and holidays (Thanksgiving), giving us a total of two and a half weeks of data. Due to unexpected circumstances, data for the following days were not collected: November 15, November 16, November 18 and November 19. Additionally, the project team analyzed data provided by Daniel Scott, the data systems manager for the Radiology department, to determine a historical trend regarding the volume of patients flowing through the departments affecting recovery/holding. Unfortunately, the data we received was only for the month of November. Also, it was very large, complicated, and incomplete. Therefore, no meaningful findings could be extracted from the data in the short time it was available, though it is believed that relevant information could be found with further analysis.
In addition to this method of data collection, the project team conducted a literature search on over-utilization of rooms in hospitals. The purpose of this literature search was to determine how over-utilization has been handled in other cases. Currently, no information regarding other situations have been located.

The project team also conducted an interview with the Wendy Hamilton, RN. in order to see how she viewed the utilization of the recovery/holding room. From this interview the team received valuable information regarding the history of unsatisfactory incidents in the Radiology recovery/holding room and her views on over-utilization in the room. A transcript of the interview can be seen in Appendix D.

Findings and Conclusions

Daily Activity

The first step was to determine if there was an over-utilization problem in the Radiology recovery/holding room. Over-utilization of bays is defined as when the total number of patients in the room exceeds 12. When this occurs patients are placed in less than optimal conditions. The frequency of over-utilization in the Radiology recovery/holding room can be seen in Figure 2. From the graph, one can tell the percentage of time that the room is in a certain range of utilization.

As seen in the graph, the Radiology recovery/holding room is over-utilized 6% of the time. This seems like a relatively low number, however, because being over-utilized for even a short time can cause a compromise of patient care, it is still a problem. It is also important to note that the Radiology recovery/holding room is 80% or more utilized 28% of the time. The target schedule for the room is to be 70% utilized according to Professor Richard Coffey, Director of Programs in Operational Analysis.

Being over the target utilization rate for 28% of the time can lead to overworked nurses. For example, it can be seen from Figure 3 below that for 5 to 7 hours, on average, the nurses are at or exceeding their regulated capacity. This can lead to over-worked nurses with low job satisfaction and a lower quality of patient care. Keep in mind that this is the average case; some cases exceed even this level, resulting in severe understaffing situations. Instances were seen where a staff able to properly handle 9 patients were handling 15 (Nov 3, 1999 below in Figure 4).
The utilization of the room varied substantially during our data collection period. Some days, the room was under-utilized for the entire sample period. For instance, on Nov 4, 1999, the number of patients peaked at 10. On other days, such as Nov 3, 1999, the room was over-utilized for almost 2 hours, and as mentioned before, peaked at 15 patients twice. This shows that over-utilization does in fact occur, and occurs for more than a trivial amount of time. These peaks occur on other days in sample period (see Appendix E for more examples), and should be addressed. Every area above 12 patients represents over-utilization and a possible incident, while every area above 9 represents an area of understaffing. Both can result in compromised patient care.

**Daily Averages and Trends**

Once it was determined that over-utilization of the bays does in fact occur, the project team next inspected daily averages to determine if there was a trend related to day-of-the-week. No trend was observable per day, though a general trend was. Patients appear to peak around 10:30am and then again around 2:30pm. Patients ramp up from 8:00am to 10:00am and then tapers down between 3:00pm and 5:00pm.
**Inpatient/Outpatient**

The project team also wanted to see how outpatient and inpatients numbers were related, and how they moved throughout the day. Unfortunately, the data collection form was not used as intended, and the data describing recovery vs. holding was not valid. In times of overflow, recovery patients can be put in the holding area and vice-versa. This was not reflected in the data collection, so there was no way to determine how many inpatients were really being recovered or being prepped. The only valid data that can be scrubbed from the form is the total number of inpatients vs. outpatients, and the total number of patients in the recovery/holding room at any one time.

**Scheduling Practices**

The project team also wanted to see how scheduling information was correlated with the peaks in utilization that occurred. The radiology recovery/holding supports the Angio, CT and US Radiology departments. Scheduling information was acquired from each of these departments. The problem encountered was that scheduling for radiology recovery/holding was not centrally controlled. Each of the different departments had their own scheduling system and did not communicate that schedule with the recovery/holding room. In addition, the scheduling information that was receive was incomplete and therefore no conclusive data could be extracted.

When patients are scheduled, they are scheduled for procedures, not for holding or recovery. As the procedure rooms are the most expensive component in the patient’s trip, they need to be scheduled as tightly as possible. The recovery/holding room plays a supporting role to the procedure rooms; it prepares and recovers patients going into and coming from them. Consequently, it would be difficult to directly schedule the recovery/holding area.

Currently, the recovery/holding area receives a schedule of the next days currently scheduled procedures. This is a rough benchmark that can be used to determine how busy the next day will be. From interviews with Sophia Jan, it was learned that the schedule is generally almost meaningless. She indicated that it was near impossible for her to tell the project team how busy the next day would be. Because she has no way of knowing this information, any perceived upcoming over-utilization of the recovery/holding area cannot be communicated back to the departments scheduling the procedures. Consequently, the recovery/holding room has to accommodate all the patients sent to it and cannot easily inform the other departments that the room is full and cannot accept any more people.

What usually occurs in the Radiology recovery/holding is that the majority of prepping is required by Angio patients and that the recovery time is fairly distributed among all three rooms. According to the nurses, the majority of the prepping emphasis is on Angio patients and the recovery focus is fairly equally divided among recoveries from CT, Angio, and Ultrasound. The most poignant problem revealed to us by the nurses in the Radiology recovery/holding room is that patients waiting for an Angio procedure are prepped and then continue to wait for extended periods of time. Sometimes, they are prepped for an Angio procedure on a given day and never even make it into the Angio room, because Angio is simply too busy.

An extension of this, is that when there are numerous patients waiting for Angio, the room itself starts to fill and the number of available bays starts to diminish. There are a limited number of bays regardless of what the patients are waiting for. In general, CT and Ultrasound patients make it through the prepping procedure rather quickly, but if there are many Angio patients waiting for the Angio procedure room things can get backed up. Nurses may have to start moving patients around to better serve them. As the room continues to fill the Radiology recovery/holding room will run out of bays. When this happens new patients will have to be put against walls, in front of the bathroom, in the hallway or even in front of the cleaning room. According to nurse Wendy Hamilton, when this happens patients are visibly upset. Patients may start to complain. It also has occurred that a patient has left AMA – (against medical advice). This is the worst-case scenario, but the nurses have explained to us that they feel this patient checked out as a direct result of a lack of privacy due to overcrowding of the Radiology recovery/holding room.
Recommendations
According to the data, the Radiology recovery/holding room is over-utilized 6.19% of the time. In addition, the Radiology recovery/holding room is 80% utilized 28% of the time. From this, and supporting data, it was concluded that there is a bay over-utilization problem. From the data that was collected, the project team determined two main methods of solving this problem. These two proposed solutions are
1) To construct more bays for the Radiology recovery/holding room and
2) Conduct further research to produce a centralized scheduling system

Additional Bays
One suggested idea to help alleviate the patient flow going through Radiology recovery/holding is through the addition of more bays. If more bays were constructed, the strain on the current resources available in Radiology recovery/holding would be reduced. Along with the additional bays, more staff would have to be hired to support these spaces, adding to the cost.

Although the solution would reduce over-utilization in the Radiology recovery/holding room, the project team feels that this is not an optimal solution. The addition of bays would only be a temporary solution to the over-utilization problem. The construction of these additional bays could take 1.5 or more years due to building procedures in the hospital. In addition, the construction of new bays and would be very expensive, proving this project not to be very cost-effective.

Most importantly, the construction of additional bays would only solve the over-utilization problem temporarily. If the radiology department continues to expand at its current rate there will once again be issues of an over-crowding in the future. The addition of bays only provides a temporary solution. Additionally, while waiting for the new bays to be finished, the problem would still exist until completion of the bays has ended.

Across the hall from the main entrance to the Radiology recovery/holding room, there is a small room that currently is only used to store old computers. One suggested idea to help alleviate the patient flow going through Radiology recovery/holding is that this extra room be re-designed to accommodate additional patients. More specifically, if those patients who require procedures to be performed could be moved across the hall, the strain on the current resources available in Radiology recovery/holding could be slightly reduced.

Solving the Scheduling Problem
The project team identified the lack of communication between the Radiology recovery/holding room and the departments that it supports as the main fault behind the problem. Currently, no central scheduling between the departments within Radiology exists and this is where the root of the problem lies. The problem lies within the Radiology department; it does not lie in the Radiology recovery/holding room. The scheduling, or lack thereof, occurs further upstream.

As stated before, most of the scheduling in Radiology recovery/holding operates in a haphazard way. Schedules are known only the night before; patients are randomly scheduled throughout the day. The situation in the radiology recovery/holding room is similar to that of an emergency room. There is no way of predicting whether the patient numbers will be high or low. Since this is the case, it is recommended that a further study be conducted in order to find some sort of trend in the scheduling information. Also, collecting data on patient flow, including where they're coming from, where they're going to, and times regarding room entry, work start, work end, and room exit would help the study immensely. It is likely an outside agency will have to collect this data, as the nurses are currently too busy to collect it in a consistent manner. By collecting this data, the department would have a better idea who exactly recovery/holding is supporting, and who's taking up the most time.

Next, the recovery/holding room needs to have better communication with the departments that are being supported by it. A scheduling system needs to be put in place that takes into account volume...
passing through the recovery/holding room and pro-actively prevents over-utilization. From the data collected, it has been shown that early morning and late afternoon are under-utilized on average. Moving more procedures to times that would cause patients to be in recovery/holding at these times would be advantageous. To do so, the average time each procedure takes to perform would have to be known, along with any details that would affect each individual case. A point system could be developed that builds on a base procedure time to determine a more accurate procedure time for each individual. For instance, if a patient has a certain condition that could cause a standard procedure to take a longer time, this condition would add time to the allocated procedure time. This would reduce the difference between actual procedure time and predicted procedure time.
Appendix A

The Recovery/Holding Room

9 10 11 12

8
7

3
2

1

6

5

4
Appendix B

Patient Flow Chart

Patient Enters

Prep or Recovery?

Recovery

Prep

Prep

Prep or Recovery?

Recovery

Prep Patient

Is Procedure Room Ready?

No → Wait

Yes → Perform Procedure(s)

Is Phase if Recovery Needed?

No → Patient Exits

Yes → Go Through Checkout Procedures

Additional Procedures Needed?

No

Outpatient → Inpatient or Outpatient?

Inpatient → Patient Leaves

Perform In-Room Procedures

Yes → Recover Patient

14
Appendix B Continued
Flowchart Details for Prep

Start Prep

Inpatient or Outpatient?

Inpatient

Start IVs / Blood work

Wait for Procedure Room

Collect Patient Information / Consent

Outpatient
## Appendix C

### Sample Data Collection Form

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<th>Number of Outpatients</th>
<th>Number of Inpatients</th>
<th>Minor Procedure if any?</th>
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Appendix D

The following is the text version of one of the interviews with Wendy Hamilton RN. Wendy has been working for 23 years, 8 years in Radiology, 3 years Radiology recovery/holding.

Q. Describe the problem as you see it in Radiology recovery/holding room?
R. Patients get really upset about moving around and getting squeezed in. Patients are sometimes not satisfied with the service they are getting. Scheduling too many patients and lack of privacy and respect (not by nurses, but people deserve more respect as human beings). “Everybody has the right to special care and not to be shuffled around” <Wendy quotes a patient> – is a quote from a patient that sticks out in my mind. Every patient can see the overcrowding.

Q. Is there a way to document complaints?
R. Nurses can fill out reports of complaints given by the patients. Additionally patients can fill out their own complaints.

Q. How has that worked or been going?
R. We are working on doing those kinds of reports more.

Q. Why is there overcrowding?
R. The room is too small and there are too many patients scheduled for the space available. If there are 7 people scheduled for procedures at 1pm and there are only 6 bays available, well you can see that this is a problem. In this event one of the patients needs to be put somewhere either in the hallway or in front of a bathroom or in front of a cleaning closet or somewhere they are not supposed to be.

Q. Are you understaffed?
R. The staffing is not adequate as it is currently, but nurses are taken from a pool so that the required number of nurses is met. These nurses are proficient in their skills but they can’t work alone and they need to be supervised for lack of experience in Radiology recovery/holding or a specific skill set required of nurses here.

Q. Is there a problem in other departments? Possibly Angiography?
R. There is a problem in that office, because sometimes a procedure is scheduled to take 1 hour and it would take up to three hours. This is fine for the patient. If I were the patient and my procedure needed to take longer than well, I would not be in any hurry. However, for other waiting patients this can cause a longer wait time and for patients to stack up waiting for Angio.

Q. What is your solution to this problem?
R. Planning needs to start now. I feel that in 5 years there might need to be as many as 15 bays for outpatient cases alone...9 more than there are now. This also goes for recovery as well. Most of our prep work is done for Angio cases, but Angio in general recovers rather quickly. Whereas CT and Ultrasound usually take longer even though there are less of those patients to recover.

Q. Are some of the nurses upset with the work load?
R. Yes. Many nurses are upset with the lack of control. In other departments a hold can be on the number of patients that come into a department. Radiology recovery/holding can’t do that. We have to take what is given to us and this can sometimes be frustrating. We here complaints from patients. That is difficult to deal with. It is also difficult to prep patients and never have them make it into a procedure room.
Appendix E

All Data Collected

All Data Collected

Appendix E