

Teaching Workflow Analysis and Lean Thinking via Simulation: A Formative Evaluation

by Robert James Campbell, EdD; Laura Gantt, RN, PhD; and Tamara Congdon, RN, BSN

Abstract

This article presents the rationale for the design and development of a video simulation used to teach lean thinking and workflow analysis to health services and health information management students enrolled in a course on the management of health information. The discussion includes a description of the design process, a brief history of the use of simulation in healthcare, and an explanation of how video simulation can be used to generate experiential learning environments. Based on the results of a survey given to 75 students as part of a formative evaluation, the video simulation was judged effective because it allowed students to visualize a real-world process (concrete experience), contemplate the scenes depicted in the video along with the concepts presented in class in a risk-free environment (reflection), develop hypotheses about why problems occurred in the workflow process (abstract conceptualization), and develop solutions to redesign a selected process (active experimentation).

Key Terms: lean thinking, workflow analysis, process analysis, experiential learning, Kolb, video simulation, simulation, health information management

Introduction

To properly implement information technology within a healthcare organization, it is important to perform workflow analysis on the processes and services that will be affected by technological changes, such as the adoption of the electronic medical record (EMR) or computerized physician order entry. Wager, Wickham-Lee, and Glaser warn that failure to perform a workflow analysis will result in “the automation of outdated and inefficient processes.”¹ A current trend in healthcare is to use what has been termed “lean thinking,” an approach to process improvement based on the Toyota production model.^{2,3} The goal of lean thinking is the continual improvement of processes and services through the identification and elimination of waste. Elimination of process waste, it is believed, will result in improved efficiency and a reduction in medical errors and healthcare costs.⁴ In the field of health services and health information management, there is no documented evidence showing how workflow analysis is best taught to students and practitioners in the field. This article examines an innovative approach based

on principles derived from educational psychology and the use of a simulation video to teach workflow analysis and lean thinking to students enrolled in a course on health information management.

Background

Kolb's theory of experiential learning posits that learners *acquire* information through concrete experience or abstract conceptualization.⁵ Learners then *transform* that information into knowledge through reflective observation or active experimentation. To apply these ideas in the classroom, Kolb and Zull recommend developing instructional sequences that focus on the four touchstones of the experiential learning cycle: concrete experience, reflection, abstract conceptualization, and active experimentation.⁶ Stated simply, an instructional sequence should present learners with a concrete experience and allow learners to reflect on that experience, develop theories and conceptualizations based on their reflections, and then create experiments that prove or disprove their theories. By actively testing out their theories, learners generate more concrete experiences, allowing for their continual progression through the learning cycle. With each progression through the cycle, learners develop knowledge of how the information presented in the classroom can be used in a real-world setting.⁷

Teaching Workflow Analysis and Lean Thinking

By their very nature, workflow analysis and lean thinking are abstract topics. To understand each topic, learners must deal with concepts such as value, value stream mapping, flow, pull, perfection, current state, future state, waste, and process metrics.⁸ These concepts are tied directly to workflow analysis. For example, for every healthcare process, the question must be asked: "How does this process add value to the customer?" Processes must be broken down into component steps using value stream mapping, with each step analyzed in terms of the value it adds to the customer. Processes must flow uninterrupted, without unnecessary wait times, and must be completed when the next step in the process is ready (pull) and always with an eye toward perfection.

In a typical learning environment, these concepts could be presented using lectures, case studies, and textual descriptions of healthcare-related processes and services. The problem with this type of instruction is that the focus is on one part of the learning cycle, namely, abstract conceptualization. What is needed is a method of instruction that provides the learner with a concrete example of a process or service that is performed within a healthcare organization; this allows them to apply the concepts of workflow analysis and lean thinking toward the improvement of that process in a safe and nonthreatening environment.

The emphasis on concrete experience is important because, as Nichols points out, we all learn through our senses: hearing, sight, taste, touch, and smell.⁹ The most important of these, according to Groombridge, is sight.¹⁰ Zull explains that the word *teacher* is derived from the old English word *techen*, which meant "to show," and he notes that to help students understand an idea, a concept, or a principle, we need to provide them with an image of how the subject under study manifests itself in real life.¹¹ This fact takes on deeper meaning because "our concrete experience of seeing is retained in a concrete form of physically connected neurons in the brain."¹² Concrete experience is important because it "contains much of the information we need for understanding, because it produces images for our brains to analyze, rearrange, manipulate, and turn into action."¹³ Without images, and with only the use of words, understanding a concept, idea, or principle is difficult because students cannot see what the teacher is trying to show them.

Helping Students to See

To provide students with the concrete experiences they need to learn to perform workflow analysis and implement lean thinking, the educational strategy known as simulation was selected. Hanna defines a simulation as “a role playing situation that relates to real life roles that may or may not use materials such as videotapes, film, tape recorders, or computers.”¹⁴ Simulations have been used in the fields of medicine and nursing since 1930 and manifest themselves in the following formats: training models that resemble anatomical parts of the body, mannequins capable of simulating various complex medical scenarios, role play, and video-based presentations.¹⁵⁻¹⁹ The five most important advantages of using simulation as an educational strategy include that it creates learning environments that promote experiential learning; allows for learning to develop without fear of personal failure; provides greater learner control over the environment, which promotes independence and skill development; mimics the clinical environment students will encounter upon graduation; and creates a role-playing situation that allows students to perform real-life roles.

The decision to use a video simulation was made based on the fact that video can be saved to a CD-ROM or DVD and easily distributed to students. For distance learners, the video can be posted to a course presentation tool such as Blackboard or Sakai. Individual students or groups of students can then watch the video simulation in class or outside of class, alone or while working in groups. Furthermore, with a video simulation, students have more control over the presented concrete experience. They can use a tool such as Windows Media Player to rewind, go forward, and repeat a section of the video simulation to study key moments in the presentation as they learn to use presented concepts to redesign the simulated workflow.^{20, 21}

As a tool for presenting simulations, video, according to Brown, has been used in three broad categories: as a substitute for live instruction, as an adjunct to other teaching methods, and as a means for providing skills training to healthcare professionals.²² This last category, skills training, made video simulation the obvious choice for this project. In the past, video simulations have been used to teach manipulative skills such as taking blood pressure; to develop interpersonal skills such as communications counseling, interviewing, and teaching; to encourage role play; and to show examples of poor and model practices.²³⁻²⁵ For this project, video simulations were created to demonstrate the wrong way and the right way to perform a specific process. Students would first view the poor performance, then redesign the process, and finally view the correct way to perform the process as a measure of determining how well they performed the workflow process redesign.

Developing the Video Simulation

To develop the video simulation, Chang and Hirsch’s production process was employed.²⁶ This process can be broken down into three stages: pre-production, production, and post-production. The pre-production stage included topic selection, preparation of the script, budget planning, personnel considerations, and identification of the required equipment.

Topic Selection

To identify a suitable process that could be simulated and used to teach workflow analysis, the main author consulted the staff at the East Carolina University College of Nursing Simulation Laboratory. After an initial meeting with the director of the simulation laboratory, the main author reviewed an article by Catchpole that described the process of handing over a patient from surgery to intensive care and the

techniques used to improve the safety and quality of this process.²⁷ At first blush, this seemed like a good process to simulate. However, several other factors needed to be considered. Those factors included that the process must be stimulating to students, be subject to Joint Commission standards and other regulatory requirements, provide an opportunity for students to theorize how information technology could be implemented to improve the selected process, and allow actors to make both subtle and egregious mistakes; furthermore, expertise must be available to develop a simulation of the process that exhibits fidelity, face validity, and visual fidelity.²⁸ Fidelity in this case relates to how true to the real-world process the experience is. Because many students had not worked in a healthcare setting, it was important to provide them with a simulation high in visual and real-world fidelity.

After further discussion with the staff of the simulation laboratory, a decision was made to simulate the process of performing a Norwood procedure for the correction of a congenital heart defect on an infant and the subsequent transfer of the infant from the surgical unit to a neonatal intensive care unit (NICU). Selection of this process was advantageous because simulation of a surgery and transfer of an infant to a NICU would be stimulating to many of the students in the class; this would likely be their first time seeing what goes on in a surgical suite and witnessing how healthcare professionals interact with each other. Second, this process would introduce them to the Joint Commission's Situation-Background-Assessment-Recommendation (SBAR) standard of reporting between health professionals, as well as the universal protocol standard.²⁹ Third, students would get an opportunity to theorize how to implement information technology, namely the electronic health record, to document what occurs during the surgery and subsequent transfer. Fourth, this process would allow the actors to make mistakes, such as contaminating the sterile field or cutting off the baby's identification bands, that need to be identified by students and eliminated from the transfer process altogether. Fifth, because the director of the simulation laboratory was a former emergency department nurse and a member of her staff was a former director of a neonatal intensive care unit, expertise was available to design a video simulation that would have high fidelity (authenticity) and face validity, and because the simulation laboratory contained a fully functional operating room and NICU, the simulation would have visual fidelity (a realistic visual scenario).

Preparation of the Script

The script for the video simulation was developed by the director of the simulation laboratory and the former director of a local hospital NICU. The script included the following roles: floating nurse, scrub nurse, two operating room nurses, nurse anesthetologist, doctor observer, and heart surgeon.

Budget and Personnel Considerations

The simulation laboratory services are free to faculty in East Carolina University's College of Nursing and College of Allied Health Sciences. Each part in the scenario was played by a faculty or staff member of the simulation laboratory, a senior nurse anesthesia student in the College of Nursing, or a resident from the university's medical school. Before the video was produced, all personnel taking part in the simulation reviewed the script several times and practiced their roles in several rehearsals.

Required Equipment

The equipment required for the video simulation included the surgical room, the neonatal intensive care unit, an infant simulator, a respirator, a chest tube, an intravenous line and pumps, patient monitoring equipment, and an isolette.

Production and Post-production

The video simulation was filmed by an instructional technologist assigned to the College of Nursing simulation laboratory. This individual was also responsible for editing and distributing the video in CD-ROM, DVD, and Windows Media video (wmv) format.

Using the Video Simulation in a Course on Health Information Management

Health Information Management is a required senior-level course for all health services management and health information management majors. The course is taught by one faculty member to students in either a face-to-face or distance learning format. Students who choose the distance learning format interact with the instructor using Blackboard and the Centra learning platform. Centra allows the instructor and students to come together to form a virtual classroom where all parties can communicate in real time using video, text messaging, voice, a whiteboard, shared computer applications, and other interactive tools.

Use of the video simulation occurred at the end of the semester after students had been introduced to the following topics: what a health information system is, what the components of a health information system are, change management, acquisitions, implementation, and security. Before the instruction on workflow analysis, students were given several items to supplement the video simulation experience. The first item was a 38-page workbook prepared by the instructor. The workbook contained explanations and examples of key concepts related to lean thinking. These concepts included discussions on value, the value stream, flow, pull, and perfection. The workbook also contained a step-by-step guide to value stream mapping. Value stream mapping is the technique students would use to perform workflow analysis to redesign the infant transfer process depicted in the video simulation. Finally, the workbook presented a discussion on waste (information, process, environment, people) and examples of the types of waste that can be found in processes and services within a healthcare organization. Students were given a CD-ROM that contained the infant transfer video simulation (19 minutes in length) and a handout explaining the procedures taking place in the video. This handout contained snapshots of the individuals in the video, the roles they played, and two peer-reviewed journal articles that explained the SBAR procedure and the universal protocol. Finally, students were provided handouts on which to record the errors they identified in the video. Identification of errors would provide a means for students to identify the types of waste found in the process and reflect on ways to improve the infant transfer process.

Facilitation of Learning

Before viewing the video simulation, students received a lecture on lean thinking and value stream mapping. Students were then divided into groups. Once in groups, students were instructed to watch the video simulation and identify the errors in the infant transfer. For each identified error, students were asked to identify the type of waste the error represented. For example, one identified error was a nurse not wearing surgical gloves in the operating room. This is a type of environmental waste because it endangers the safety of the patient. Once each group had time to identify the errors in the video simulation, the class came together as a group to debrief. During this debriefing period, students were asked to identify the major problems with the infant transfer. Identified issues included safety, lack of training, lack of adherence to procedures and regulations (SBAR), improper staffing issues, and lack of leadership. Students went back into their groups to identify all the steps in the infant transfer process. Group responses were placed on a whiteboard, and the class came to consensus on the steps in the transfer

process (Appendix A). In value stream mapping, this is known as defining the current state. Students then went back into their groups charged with the task of creating the future state, or a depiction of how the process can be improved. The future state depicted by the class can be found in Appendix B.

Formative Evaluation

Did the Video Simulation Facilitate Learning?

To measure the impact that the video simulation had on student learning, a survey was administered to 75 students. The survey asked students to respond to the following questions:

1. What was your initial reaction to the transfer video?
2. Do you think the transfer video helped you learn about lean thinking and workflow analysis? Please explain.
3. Do you think the transfer video assignment prepared you to perform workflow analysis in the future?
4. Do you have any suggestions for improving this assignment?

A total of 75 students completed the course, with 70 (93 percent) completing the survey. A content analysis was performed on the responses.³⁰ Responses following a specific pattern were grouped together under a common theme. The themes emanating from each question are identified and explicated in Appendix C.

Results

Based on survey responses, 85 percent of the students felt that the video simulation helped them learn about lean thinking and workflow analysis. Regarding future roles, 69 percent of the students felt the video simulation prepared them for potential workflow analysis assignments by helping them to visualize, think more deeply, and more easily identify the underlying steps within a process. Negative feelings toward the visual simulation were minimal: 7 percent of the respondents felt that the video simulation did not help them learn about workflow analysis and lean thinking, while a separate 4 percent felt that the video simulation did not prepare them for future workflow analysis assignments.

Discussion

Of the themes identified in Appendix C, the authors focused on the categories related to the reactions, learning, and improvements.

Reactions

Under most circumstances when a learning environment creates feelings of uncertainty, confusion, chaos, and shock among learners, the first reaction of most educators would be to return to the drawing board. However, in this instance, the designers of the video simulation were happy to learn of these results because the goal of simulation is to place the learner in a real-life situation. The simulation of real-life situations, according to Satish and Krishnamurthy, “means that the subject experiences volatility, uncertainty, delayed feedback and ambiguity with inadequate information, which are part of everyday decision making.”³¹ The design team felt strongly that students would benefit from being placed in a

highly chaotic, ambiguous learning environment because the environment was risk free. Students could take chances, make mistakes, and learn from those mistakes. In many classrooms where instruction focuses on learning abstract conceptualizations, students never have this opportunity, and their only real-world experience comes on their first day on the job, where mistakes can be deadly. Finally, the learning environment created by video simulation provided an opportunity for students to develop their critical thinking skills. These skills, as Halpern notes, come into play “whenever people grapple with complex issues and messy ill-defined problems.”³²

Another major theme based on student reactions to the video was their feelings regarding staff actions. Students expressed surprise regarding the behaviors exhibited by the staff in the video. However, when one considers that the number of deaths due to medical errors occurring in the United States is estimated to be between 44,000 and 98,000 per year, it would not seem realistic to portray the operating room as a mistake-free environment.³³ The behaviors depicted in the video, from the wrong medication being delivered to the operating room, to the nurse pulling up her surgical gown to retrieve a pair of scissors from her pants pocket to remove the baby’s identification bands, were included in the simulation as a conscious effort by the design team to display actions that they have witnessed in healthcare organizations. The students’ feelings toward both the video and the staff behaviors serve as evidence that the design team was able to meet the goal of creating a visually stimulating simulation that captured students’ attention: students were made to think deeply as to whether the actions portrayed in the video simulation could or, more importantly, should take place in a healthcare organization. This will be a very important skill for students to possess as they enter the work force as health service and health information managers.

Learning

The focus of the second and third survey questions was to determine whether the video simulation helped students learn the skills associated with lean thinking and workflow analysis and whether they would be able to apply those skills to future workflow problems. One goal for the video simulation was to create an experiential learning environment within the classroom. To satisfy this goal, the video simulation would need to provide students with a concrete example of a workflow process so that students could envision the process, reflect on it, develop abstractions (hypotheses) based on what they viewed, and then actively experiment on selected hypotheses in hopes of improving the process. A common theme emanating from responses to both questions was that of visualization. Students felt that the video simulation allowed them to visualize the process, manipulate the process, and then develop a solution to improve the process. Evidence that the video simulation helped students to progress through the stages of Kolb’s learning cycle can be found in the following quote:

I do think that the transfer video [concrete experience] helped me learn more about lean thinking and workflow analysis because I had to go back through the notes on lean thinking. This enabled me to get a better grasp [active reflection] on what I was looking for in the video, and I was able to put the knowledge [abstract conceptualization] I gained from rereading the notes to better use. It helped me to identify [active experimentation] more mistakes [concrete experience] in the video.

Other evidence that the video simulation promoted student learning include the themes of learning (30 percent), preparation (24 percent), and thinking (12 percent). A small minority of students, 7 percent (question 2) and 4 percent (question 3), did not feel that they benefited from the video simulation.

Improvements

To improve the use of the video simulation in the classroom, students expressed the need for more clinical information to help them process what they viewed in the presentation. These comments were perplexing to the authors of this study for several reasons. First, the video simulation was not overly clinical in nature. Students witnessed a simulated operation taking place and the subsequent move of an infant from the surgical suite to the NICU unit. Along the way, the staff committed several errors to contaminate the sterile environment of the operating room, displayed a lack of understanding of how to operate an isolette, and performed improper patient handoff procedures. A second concern is the way in which important concepts are taught to students enrolled in health services and health information management programs. Should more emphasis be placed on the development of critical thinking skills to help students solve ill-defined, ambiguous, and information-poor problems? As Halpern explains, critical thinking about problems, just like thinking in the real world, is “effortful in nature” and requires students to be deliberate and intense.³⁴ Because students were supplied with a workbook, a handout, and journal articles that provided the information they would need to successfully complete the video transfer assignment, consideration must be given as to whether students made full use of these resources. In evaluating the above statements, it is important to note that 30 percent of the responses to question 4 indicated that no improvements needed to be made to the video simulation.

Other identified requests for improvement included shorter videos, a mock video to be used as an advance organizer, better sound, and the use of a different room for students to view the video. In terms of shorter videos and the use of a mock video, the authors will consider using a shorter mock video to orient students to the workflow process and the identification of errors.

One problem that was evident throughout the use of the video simulation in the classroom was sound. Students were broken up into groups, and it was not uncommon to have four different versions of the video simulation running on student laptops at one time. Some groups went out in the hall to work, while another group went to the library. In the future, a bigger room with better acoustics will be needed so that students are not distracted by what other groups are doing. Another alternative would be to provide students with a device that allows them to plug multiple headphones into one laptop.

Finally, the authors feel it is important to discuss the theme representing students’ desire for a nonclinical simulation. A major concern of the authors, especially the nurses, is that this type of thinking perpetuates the divide between the administrative and clinical aspects of healthcare. One of the key principles of lean thinking is to eliminate this divide and, more importantly, to get managers out of their offices and onto the shop floor, or, in the example of the video simulation, into the operating room and the NICU. To appropriately use technology and get clinical staff to use new technology, managers must understand how clinicians perform their jobs. A goal of this simulation was to provide students with some level of understanding of how clinicians and nursing staff perform their jobs. A final concern, reflected in several students’ comments, is that the principles of lean thinking are the same in manufacturing and finance as they are in healthcare. The industries may be different, but the techniques used to improve the processes are the same. To provide an example, Virginia Mason Medical Center in Seattle, Washington, was one of the first hospitals to adopt lean thinking.³⁵ To understand the lean thinking process, they didn’t send all their senior executives to another healthcare organization, but to a Hitachi air conditioning plant in Japan, to study how that organization implemented lean thinking. For healthcare to move forward, administrators and clinicians must be helped to work together as a team.

Conclusions

Kolb's theory of experiential learning was used to develop a video simulation to teach students the key principles behind lean thinking and workflow analysis. As a theory for designing classroom instruction, experiential learning focuses on the idea of placing the learner in direct contact with the realities being studied, rather than merely having the learner think about them in an abstract way. To test the success of this endeavor, a student survey was used as a formative evaluation. When asked whether the video simulation helped them learn about lean thinking and workflow analysis, 55 percent of the students stated that the simulation helped them to visualize the transfer process. Because of their enhanced ability to visualize the transfer process, students reported "being able to clearly see and define each step in the process," which allowed them to determine what changes needed to be made. Visualization is a key component of experiential learning because when people can witness something firsthand, they are in a better position to manipulate the images generated in their mind, thereby enhancing their ability to reflect on what they have seen, develop hypotheses, and then ultimately test those hypotheses as a way to solve the problem.

When asked whether the video simulation prepared them to perform workflow analysis in the future, 24 percent of the students cited their ability to visualize the transfer process as a positive. Furthermore, an additional 24 percent believed that the video simulation prepared them for future workflow assignments.

Finally, the video simulation was successful because it gave students a taste of life in a clinical setting. For many of the students, this was their first opportunity to visualize the actions that take place in a surgical suite and a neonatal intensive care unit. Because the video simulation contained errors and showed clinical staff performing with total disregard for the safety of the patient, it heightened the experience and gave students a sense of the importance that workflow analysis plays in patient care and safety. The results of the formative evaluation suggest that video simulation is a good method for operationalizing Kolb's theory of learning because it places students in a real-world situation that allows students to visualize a process, reflect on that process, and develop solutions for process improvement.

Future Directions

Overall, the evidence presented suggests that when used appropriately, video simulation of a selected process can help students learn about lean thinking and workflow analysis. Because the evidence is based solely on student opinion, authentic techniques must be developed to assess what students have learned via their exposure to the video simulation and, more importantly, whether students can transfer the skills learned to other healthcare and nonhealthcare processes and services. Currently, assessment is a weak area in the field of medical simulation; one of the goals of the authors will be to develop an assessment tool for students who use the transfer video simulation. Another goal for the design team will be to embed elements of gaming theory into the video simulation to enhance appeal and increase student interaction. Examples include creating a point scoring system for the type and number of errors identified, and assigning roles to students. Students taking on a specific role will examine the role and make suggestions for how that role can be improved. This may alleviate some of the emotional and cognitive overload that students experienced as they began to view the video. It may also help students to focus their attention on one specific feature of the video simulation rather than trying to take in the entire video all at once.

Finally, the authors agree that students should be exposed to both clinical and nonclinical processes and services. This will allow students to transfer their newly acquired skills as well as their critical

thinking skills to unfamiliar processes. With this in mind, the authors will begin to develop other video simulations to complement the transfer video simulation.

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Acknowledgments

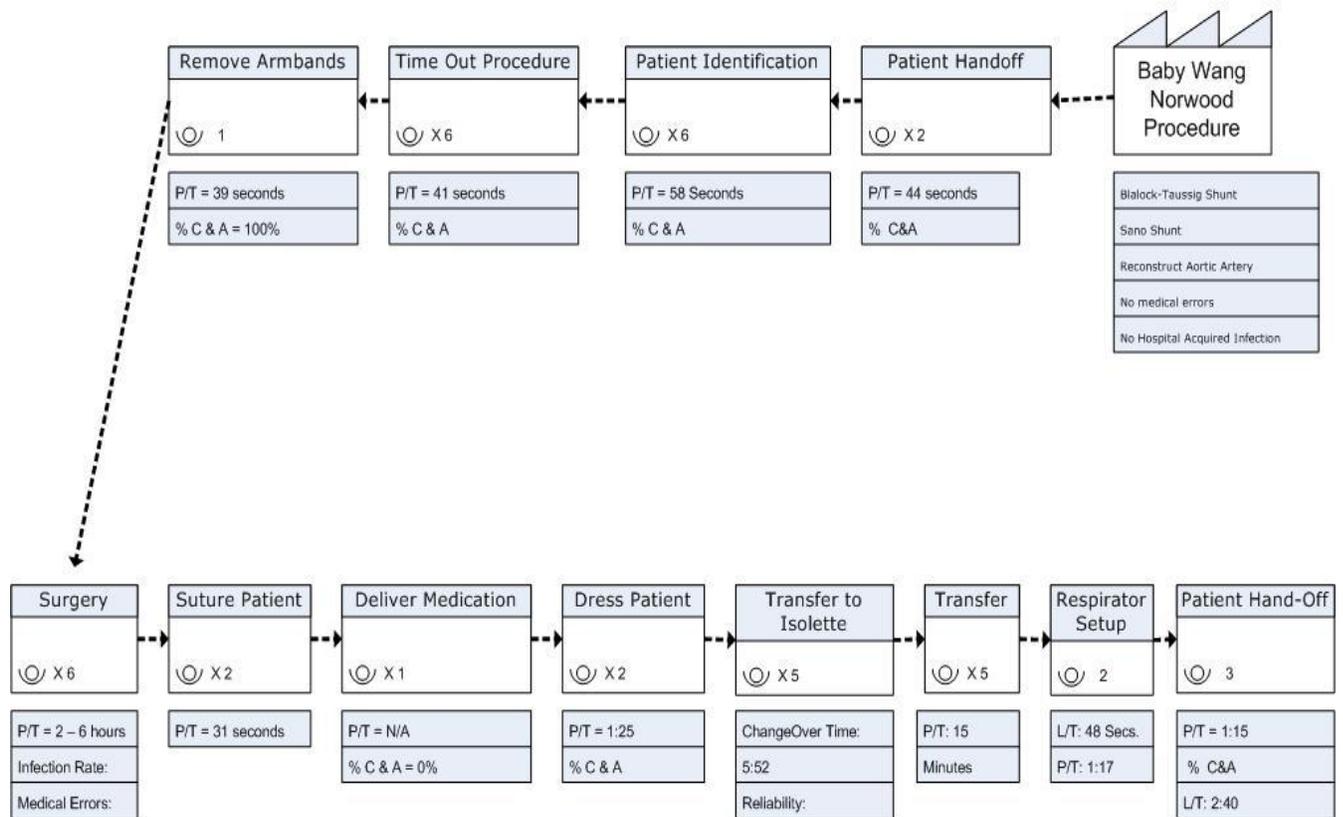
The authors gratefully acknowledge the contributions of the following East Carolina University staff and faculty to this project: Megan E. Beasaw, MLIS; Rita Coggins, RN, BSN; Shelby Donnelly, BA; Melinda Walker, RN, BS; Melydia Edge, CRNA; Daniel Brock, CRNA; and Tiffany Radford, SRNA.

Notes

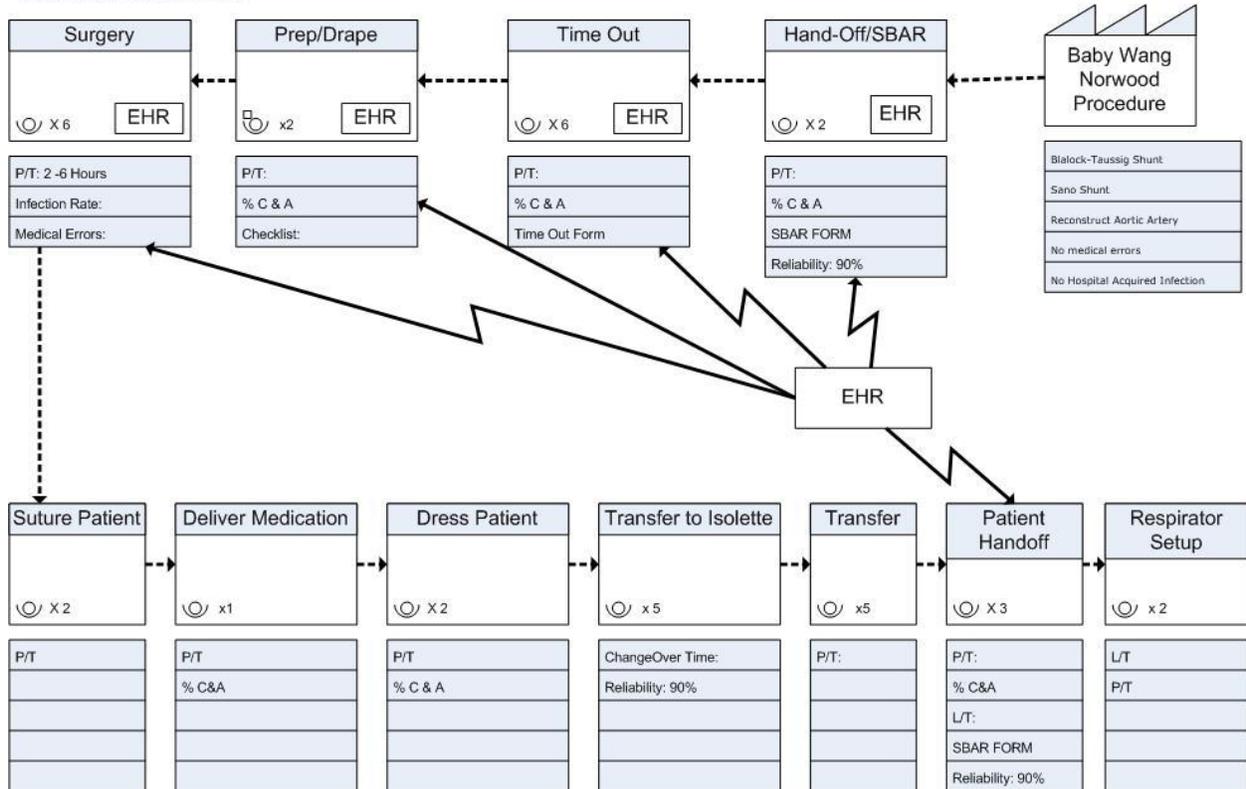
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Appendix A: Current State



Appendix B: Future State



Appendix C

Content Analysis

Question 1

What was your initial reaction to the transfer video?

Seventy students provided responses to this question. From their replies the following themes emerged.

Theme: Errors (29 responses; 41 percent)

A major pattern flowing throughout this theme was students' feelings of uncertainty, confusion, chaos, shock, difficulty, and being overwhelmed. These feelings were generated by the number of errors presented in the video simulation. Students felt that because they had no clinical background they would not be able to find the errors depicted in the video simulation, especially after viewing it only once. However, after viewing the simulation several times, students began to feel that the errors became more obvious and easier to identify. One student commented that this was a good training exercise in that you really had to look at and think about what was going on.

Example statements:

Initially, I was a little overwhelmed trying to figure out all of the mistakes that were taking place. Everything happened rather quickly.

It was a bit chaotic. If you had any background in surgery or ever had an operation you knew it was over the top. I thought it must be hard for those people to do their jobs wrong. A good training exercise in that you really had to look and think about what was going on.

Theme: Staff actions (13 responses; 19 percent)

Students expressed surprise at how unprepared, disorganized, confused, and unsterile the transfer staff was depicted to be in the video simulation. Students also commented on the fact that no one seemed to take charge of the transfer process.

Example statements:

I was shocked that most of them were not wearing gloves. Even though it was staged I thought they did a good job.

The first time I watched the video, I was very surprised by the content. The staff were not prepared, [not] organized, and very unsterile.

Theme: Interest (9 responses; 13 percent)

Students felt that the video simulation was interesting and entertaining. One student commented, “I thought it was cool to see what actually went on in an operating room setting.” Another student added that because of the interest generated by the video, “It made me go to the actual website and watch the real surgery video.”

Example statements:

I thought the video was interesting.

It was entertaining.

Theme: Technical aspects (7 responses; 10 percent)

Students expressed concern regarding technical aspects of the video. Comments focused on the level of detail depicted in the video, the level of sound juxtaposed with the annoying sounds made by the patient monitoring devices, the amount of activity taking place, and the length of the video.

Example statements:

The beeping was annoying.

Thought there was too much going on, very noisy, and made it hard to follow everything.

Theme: Value (5 responses; 7 percent)

Students expressed a belief in the educational value of the video simulation.

Example statements:

I thought it was a good method for learning that is not used enough.

I thought it was a good tool to allow observation of a clinical process where there is potential for error and time studies.

Theme: Disbelief (4 responses; 6 percent)

Students expressed a level of disbelief about what they witnessed in the video simulation. One student likened it to “YouTube video.” Another student expressed concern over how much waste was depicted in the video.

Example statements:

I could not believe what I was seeing. My initial thought was I hope I never require surgery for anything. Of course this won't be possible. I was frightened by what I observed.

Did not know what to think[.]

Theme: Feelings toward the assignment (2 responses; 3 percent)

Students expressed concern regarding the clinical nature of the assignment, doubting whether they had the experience needed to complete the activity. One student felt that by concentrating on the process of workflow analysis she was able to complete the assignment. Another student felt that a video simulation depicting a health record environment would be more suitable.

Example statement:

In terms of the assignment . . . At first I believed that I would not have the proper training or specialization to properly critique the video. By the end of the evaluation, I was looking beyond the clinical aspect and focusing on the process.

Question 2

Do you think the transfer video helped you learn about lean thinking and workflow analysis? Please explain.

Out of 70 students who responded to this question, 64 felt that the video simulation helped them learn about lean thinking and workflow analysis. From their responses the following themes emerged.

Theme: Visualization (39 responses; 55 percent)

Students expressed a belief that the video simulation helped them to visualize the transfer process. With the ability to clearly see and define each step in the process, students expressed a belief that they were better able to determine what changes needed to be made. Students also felt strongly that the video simulation made them think.

Example statements:

Yes. It allowed a process to be visualized from the outside. It is much easier to see the aspects of time efficiency and waste when you visualize the process rather than reading about it.

Yes, I think it helped because I was able to visualize it better by watching the video rather than just in my head. I liked being able to catch the mistakes on my own.

Theme: Learning (21 responses; 30 percent)

Students expressed a belief that the video simulation helped them learn how to implement lean thinking and workflow analysis (value stream mapping) to redesign a selected process. Students expressed that the video made them reflect on the material presented in the lecture and workbook to figure out how to apply the concepts to solve a real-world problem.

Example statements:

This video has definitely changed my perspective on lean thinking and workflow processes.

The video was wonderful in learning lean thinking and workflow analysis.

Theme: Debriefing (3 responses; 4 percent)

Students expressed a belief that the debriefing session helped them to see and understand how lean thinking could be used to redesign a selected process.

Example statements:

Yes, after we broke it down and we had help identifying some of the problems.

It did after the class discussed the video that [was] seen.

Theme: Negative responses (5 responses; 7 percent)

Five students (7 percent) stated that the video did not help them learn about lean thinking and workflow analysis. Four expressed a view that because the simulation was clinical in nature, it was difficult for them to determine what to change. One student felt that the video simulation did not accurately depict what may or may not take place in a transfer process.

Question 3

Do you think the transfer video assignment prepared you to perform workflow analysis in the future?

Sixty-eight students provided responses to this question; two abstained. From their replies the following themes appeared.

Theme: Visualization (16 responses; 24 percent)

Students focused on how the video simulation helped them to visualize the transfer process (concrete experience), reflect on what they witnessed (reflective observation), and then make suggestions for improving workflow (active experimentation). Students also commented on how the simulation placed them in a real-life situation without actually being present.

Example statements:

I think recording processes such as this . . . one is a good tool to allow all the members to see and reflect on the process and identify how things can be done better.

The video was an excellent tool to assist with workflow analysis in the future.

Theme: Preparation (16 responses; 24 percent)

Students expressed a belief that the video simulation prepared them to perform workflow analysis in the future.

Example statements:

I do think [I] am more prepared to perform work flow analysis in my job now. I will use lean thinking when I write [or] update protocols for the laboratory setup operating procedure manuals.

I would like to think so. Because workflow analysis is an important part of my job as a System Analyst, I am eager to incorporate parts of this model in my next project.

Theme: Reservations (13 responses; 19 percent)

Students expressed reservations as to whether they would be able to apply the concepts learned using the video simulation to redesign a future workflow process.

Example statements:

Possibly, it would depend on the situation.

I think it was a good introduction; however, I believe I would need to have more practice in order to answer this question.

Theme: Think (8 responses; 12 percent)

Students held the view that the video simulation helped them to think more deeply about workflow analysis.

Example statements:

It enabled me to understand how to think about completing a workflow analysis.

Yes; it made you think and analyze at a deeper level. The assignments really got you involved.

Theme: Process (3 responses; 4 percent)

Students expressed the view that the video simulation helped them identify the underlying process with a chosen workflow.

Yeah, it helped lay the foundation work for what the underlying process is.

Yes. Everything is a process and should be taken seriously.

Theme: Debriefing (3 responses; 4 percent)

Students felt that the class debriefing helped them to better understand the workflow analysis.

Yes, . . . discussing the video assignment has helped me understand workflow analysis.

Yes, mostly the discussion of the video after the fact.

Negative responses

Three students (4 percent) felt that the video did not prepare them to perform workflow analysis in the future.

Example statements:

No because in the real world we will not be working hands on in healthcare.

Not really. I had no idea of what was going on.

Question 4

Do you have any suggestions for improving this assignment?

Sixty-eight students responded to this question, two abstained. From their replies the following themes appeared.

Theme: Structure (23 responses; 34 percent)

Student responses focused on suggestions for structuring the way the video simulation was used to teach lean thinking and workflow analysis. Suggestions included the students' desires for more clinical information before watching the simulation, shorter videos with fewer errors, prompts for the types of errors to look for, and a mock video to prepare them to view the transfer video.

Example statements:

A little shorter. Lost focus after 10 minutes.

Provide students with the clinical information that we need to know in order to observe the errors.

Theme: No suggestions for improvement (21 responses; 31 percent)

Student responses displayed a strong belief that no improvements needed to be made to the way the video simulation was used in the course. Moreover, many of the comments contained praise for the video simulation as an instructional tool.

Example statements:

I enjoyed this assignment . . . took me a while to get it done, but I learned how to be the outside observer and that will help me in my professional career.

I think this assignment was great, and don't have any suggestions on improving it.

Theme: Attention (11 responses; 16 percent)

Student responses reflected inattention to the background materials provided as they considered ways to improve this assignment. For example, several comments focused on the believability of the visual simulation, asked for documentation that provided background information on the transfer process, or questioned the motives of the actors in the video.

Example statements:

I suggest a guide before we watch the video.

I felt the end of the video was very vague. The Charge Nurse of the NICU Department was acting rather suspicious when red hair was found on Baby Wang's dressing. She had red hair. The NICU Charge Nurse had mentioned that she had not assisted Baby Wang as of yet. Why would she deny assisting Baby Wang if she already had?

Theme: Nonclinical scenario (9 responses; 13 percent)

Students voiced a desire for a visual simulation of a nonclinical process.

Example statements:

Changing the video from a surgery to a problem in an office setting.

I would want to see a doctor[']s office since the patient really has to wait forever in these situations, and the amount of batching and [queuing] that occurs could be evaluated.

Theme: Technical issues (4 responses; 6 percent)

Students expressed concern over technical issues involved with the video simulation, namely, sound and visibility.

Example statements:

I think the quality of the video was good but I had a hard time understanding what some of the nurses were saying. I think this was due mainly to them wearing the masks and it muffled their voices.

Maybe it could have had better visibility. It was hard to make out several things as well as hear it.