Institute for Healthcare Improvement

Participant Version

Open School

Advanced Case Study: A 30-Year-Old in the Nursing Home

(http://www.ihi.org/education/ihiopenschool/resources/Pages/Activities/AdvancedCaseStudy2010.aspx)

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Learning Objectives

At the end of this activity, you will be able to:

- Analyze a complex case using concepts and skills related to quality improvement, patient safety, and other disciplines relevant to system-level improvement.
- Develop a specific plan to improve the "gap" in the system of care, including defining key measures and proposing changes, as part of an interprofessional team.
- Anticipate likely challenges to planned improvements.

Description

In this advanced case study, you'll follow Carla, a 29-year-old woman with renal failure from polycystic kidney disorder, on her complicated journey through the health care system. You'll see the multiple factors — both inside and outside of the health care system — that contribute to an adverse event that forces her into a long-term care facility long before she should be there. With a team of colleagues, you'll complete an analysis of what went wrong, why it went wrong, and how the system might be changed to prevent a similar problem in the future.

Related IHI Open School Online Courses

- PS 104: Root Cause and System Analysis
- QI 101: Fundamentals of Improvement
- QI 102: The Model for Improvement: Your Engine for Change

Key Topics

Kidney failure, patient self-management, efficiency and waste reduction, handoffs, patient- and family-centered care, redesign processes and systems, transitions in care, improvement methods (general), model for improvement, plan-do-study-act (PDSA), systems thinking, adverse event.

Note: In order to make the most of this case, it may help you to know a little bit about blood thinners and the risks associated with them.

Warfarin is in a class of medications called anticoagulants or blood thinners. It works by decreasing the clotting ability of the blood. Warfarin is used to prevent blood clots from forming or growing larger in your blood and blood vessels. It is prescribed for people with certain types of irregular heartbeat, people with prosthetic (replacement or mechanical) heart valves, and people who have suffered a heart attack. Warfarin is also used to treat or prevent venous thrombosis (swelling and blood clot in a vein) and pulmonary embolism (a blood clot in the lung).[1]

The International Normalized Ratio (INR) is a measure of the level of anticoagulation of the blood. Because warfarin can cause severe bleeding, "the safety and effectiveness of warfarin therapy depends critically on maintaining the INR within the therapeutic range."[2] If the INR level is too low, a patient could be at high risk for a clot. If it is too high, the patient could be at high risk for a life-threatening bleed. All patients on warfarin need to have their INR checked and their dose adjusted on a regular basis.

Carla's Story

Carla is a 29-year-old woman with renal failure from polycystic kidney disorder, a congenital disease that requires her to undergo frequent dialysis. For several years, she has lived in a suburb of a medium-sized city in the American southwest. Carla is single and works part-time at a small printing company. Her boss offers her the flexibility to get to her dialysis appointments — which last three hours if the center is running on time — but the time away from work is a strain for Carla and for her boss.

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[1] PubMed Health. Warfarin. http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0000634. Updated September 1, 2008. Accessed September 2, 2010.

[2] Hirsh J, Fuster V, Ansell J, Halperin J. American Heart Association/American College of Cardiology Foundation guide to warfarin therapy. *Journal of the American College of Cardiology*. 2003; 41:1633-1652. http://content.onlinejacc.org/cgi/content/full/41/9/1633. Accessed September 2, 2010.

It isn't easy for Carla to get to her dialysis appointments three times a week. She recently had to give up her car because she could no longer afford car payments and insurance, so she now relies on buses and cabs to get to the dialysis center. Carla's mother lives nearby and is a major source of emotional support; she gives Carla rides if she's able to get time off work, but that is rarely possible. Carla has a few close friends who provide her with a strong social network, but because Carla's appointments take so long and happen during business hours on weekdays, she usually has to go by herself. Carla's father lives on the West Coast, in California, and she sees him only once a year.

Due to her chronic medical condition, Carla is no stranger to the health care system. It often feels to her that she is teaching her caregivers what she needs over and over again. Frequently, it seems to her that there are so many rules in place about how her care will be handled that her caregivers and the system feel like obstacles she must overcome, rather than allies. Further, it seems that the rules are set up for the system and the caregivers, not for Carla.

A few months ago, Carla was living alone and independently in her one-bedroom apartment. She enjoyed cooking for her friends and playing the guitar. She was very handy with a sewing machine and dreamed of going to school for fashion design.

Today she's been admitted to a nursing home, unable to care for herself, due to significant complications of her disease and its treatments. Here's her story:

Day One, Monday

In her arm Carla has an arteriovenous fistula, a surgically created connection between an artery and a vein, for hemodialysis. One Monday during dialysis at her usual outpatient dialysis center (a private center in a large chain of dialysis units throughout the area), the technician notes poor blood flow through the catheter. With poor flow, it is difficult, if not impossible, to complete an effective dialysis session. Because of the poor flow, it takes five hours to complete the dialysis that day, instead of the usual three. The nephrologist, Jesse, orders an ultrasound of Carla's upper arm, to be done at the local hospital about eight miles away. The nurse, Mercedes, gives Carla a handwritten order form for the ultrasound and calls the radiology department, scheduling the test for 9 AM the next morning.

Carla is too embarrassed to tell Mercedes that she no longer has a car and may not be able to get to the test on time.

Day Two, Tuesday

Carla takes three buses in the morning, only to arrive at the hospital at 9:30 AM due to the complex bus schedule. When she checks in at the desk, the clerk, Jonas, tells her they cannot perform the test. He says the department has a policy that anyone who is more than 15 minutes late must be rescheduled. The department has a high percentage of patients who show up late or not at all, he says, and they want to be fair to those who arrive on time. Carla asks if there is any way to get the test done today, but Jonas, who got yelled at last week for sneaking in a late patient, tells her this is simply not possible. He reschedules the test for Thursday at 10 AM. Upset, frustrated, and exhausted by the fact that she just wasted several hours, Carla goes home.

Day Three, Wednesday

Wednesday morning Carla goes to dialysis as usual. This time, there is almost no blood flow through her fistula. Jesse, the nephrologist, orders a blood test of, among other things, her potassium level, to make sure dialysis is still regulating Carla's electrolytes. She is sent to the emergency department (ED) after the potassium check comes back dangerously high at 6.3 mmol/L. The care team in the ED treats Carla's potassium level with a combination of medications. An ultrasound, the same type of procedure that Jesse ordered on Monday, shows a significant blood clot within Carla's fistula that extends into her vein.

Carla is admitted to the hospital and given tPA (tissue plasminogen activator) to break up the clot — an effort that is successful. Afterward, Rachel, the internal medicine resident caring for Carla, starts her on intravenous heparin and oral warfarin (both blood thinners) to prevent the clot from recurring. A temporary dialysis catheter is placed in Carla's neck, and that night she has dialysis that corrects her high potassium level.

Day Seven, Sunday

On Sunday, Carla is ready for discharge. Lydia, the nurse caring for her that day, goes over the written discharge instructions with her. Lydia tells Carla to see her primary care physician by Tuesday to have her International Normalized Ratio (INR) checked, since she is taking warfarin.

[Note: See the top of this case for information on warfarin and the INR.]

Lydia says that after this initial check on Tuesday, Carla's primary care physician will need to check her INR on a weekly basis. The goal, Lydia says, is for Carla's INR level to be between 2 and 3 (therapeutic) to keep the risk of clotting low, but the level can fluctuate significantly over time, so it's important to make sure it's checked regularly. Carla shakes her head and tells Lydia that it'll be hard to get to her primary care doctor so her INR levels can be checked — it's just too much for her to do on top of dialysis.

Quickly, Lydia finds Ana, the social worker on the unit, and asks about an alternate plan for Carla. The two of them decide that the dialysis unit might be the best place to check her INR in the future, since she goes there anyway three times a week. Ana informs Lydia that many dialysis units follow INR levels for patients, so this seems reasonable. Ana also suggests that Carla meet with a nutritionist before she leaves. The reason is that there are many foods that contain vitamin K, which counteracts the effects of warfarin. It would be a good idea for Carla to learn which foods she should avoid after her discharge. Lydia thinks this is a good idea and decides to contact a nutritionist. However, it's Sunday, and no nutritionist is available. Lydia asks the physician filling out Carla's discharge orders to request an outpatient nutrition appointment instead.

All these instructions are written on Carla's discharge orders. Tired from poor sleep over the past few days in the hospital, Carla barely remembers hearing the instructions and leaves the written discharge instructions in her friend's car when she goes home. A discharge summary is mailed to her primary care doctor; this is the typical mechanism for communication from the hospital to outside physicians.

The hospital's appointments desk (open Monday through Friday) makes a nutrition appointment for Carla the day after her discharge, but when the case worker calls Carla, her phone is disconnected. The case worker mails her an appointment slip instead, but it is unclear whether or not she receives it. She does not come to the appointment.

Day 25, Thursday

Two and a half weeks later, a friend brings Carla to the emergency department. Carla has right arm pain and swelling. Studies show she has a new deep venous thrombosis (a blood clot in a vein deep in the body), and her INR is 1.1. When asked about her warfarin dosage, she says nobody has been checking it, and that she has been taking the 2.5 mg per day warfarin dose she was discharged on two weeks ago. She says she was aware that her INR was supposed to be checked at the dialysis unit, but that when she went for dialysis, this didn't happen. She says she brought it up with the medical assistant who took her weight and blood pressure at the start of her visit to the dialysis unit. The assistant told Carla that he didn't know about the INR issue but would check on it. Carla says she never heard anything more about it.

Once again, Carla is admitted to the general medicine unit and placed on an intravenous heparin drip and oral warfarin. It takes 10 days for her INR to creep up to therapeutic range. She has significant pain in her right arm, and she now requires intermittent oral narcotics to function. Ana, the same social worker from the last hospitalization, calls Carla's dialysis unit and speaks to the nurse manager about following the INR. Ana feels horrible about the communication lapse at the end of Carla's last hospitalization. The resident calls Jesse, Carla's nephrologist, to make sure he too is aware he needs to follow her INR levels closely, and that they will be drawn during dialysis each week.

During this hospitalization, Carla is finally able to meet with Jane, the nutritionist. It turns out that Carla has been intermittently eating spinach salads as part of a weight loss diet she is on. Spinach has large amounts of vitamin K and counteracts warfarin. These salads may well have been making her anticoagulation levels unstable. Jane gives Carla some written information about which foods she can eat as well as the importance of eating approximately the same amounts every day.

Day 36, Monday

Carla goes home late on Monday, after dialysis in the hospital. She spent her 30th birthday in the hospital. Because of visiting restrictions, her mother and friends had to leave at 8 PM rather than staying a few more hours to spend time with her.

At home Carla feels nauseated and ends up vomiting. She skips her dialysis run on Wednesday, feeling too worn out and sick to go. Mercedes, the nurse at the dialysis center, is surprised when Carla doesn't show up. She calls Carla's cell phone, but she only gets a message that the number has been disconnected. Mercedes considers calling the police to have them check on Carla. One of her patients has a sudden drop in blood pressure during dialysis, however, and in her rush to help, she forgets to make the call.

Later that day Carla realizes that her face is tingling. Her friend, the same one who took her to the ED the last time, urges her to call someone, but Carla just wants to try and get some sleep. She feels exhausted and sick.

Day 39, Thursday

Concerned when the tingling is worse on Thursday morning, Carla decides her friend was right, and she goes back to the emergency department. She arrives at the ED at 1 pm, but she has to wait two hours before labs are drawn. The physician sees her, writing in her chart that her neurologic exam was "non-focal." This wording is sometimes used when a physician completes only a cursory exam.

Carla's potassium levels are the first lab results to show up. (Typically, the lab is able to process potassium levels more quickly than INR levels, because of the way the tests are done.) Her potassium is again high at 6.7 mmol/L. Because this is considered by the hospital to be a "critical value," the lab technician calls the ED and promptly relates this potentially life-threatening result to the ED nurse, who tells the ED physician. The physician pages the nephrology fellow, who gets Carla sent over to dialysis immediately. Carla's other lab results, including her INR levels, show up about 30 minutes later. Her INR is 5.3. A lab technician enters the result into the computer.

At about 6 PM, Carla arrives on the medical surgical unit in the hospital. Fatigued, she again complains of face tingling and nausea. She is given some compazine for the nausea (there is a standing order for compazine as needed) and falls asleep.

Day 40, Friday

Early the next morning, Grant, a medical student, sees Carla. He thinks she seems overly tired but does not really know her baseline mental status. Grant decides to wait until formal patient care rounds to voice his concerns. During rounds at 9 AM, he speaks to Valerie, the attending physician. Valerie looks up Carla's lab results on the computer and notes the extremely high INR. She orders an emergency CT scan of Carla's head.

Ninety minutes later the radiologist pages Valerie. Carla has an acute subdural hematoma (a bleed on the brain). She is transferred to the intensive care unit, neurosurgery is called, and the care team gives Carla fresh frozen plasma to replace the clotting factors she no longer has in her blood. The surgeons take her to the operating room, remove the bulk of the hematoma and stop the bleeding.

Carla has a very slow recovery and is left with significant short-term memory deficits. Carla is no longer able to live on her own and after much effort by Ana, the social worker, she is admitted to a long-term care facility that can care for a 30-year-old woman with dialysis requirements. Carla will be the youngest resident in the long-term care facility.

About Carla's health care system:

Carla receives her care from several systems, the largest of which is SouthWest Medical. SouthWest Medical owns three large hospitals in the metropolitan area, including one academic hospital that has residents and medical students. SouthWest Medical also owns 25 primary care clinics, including the one that Carla goes to, scattered throughout the area. SouthWest Medical uses an electronic medical record for the hospital, but the system is still in the process of rolling this out to the clinics. Twenty-one of the clinics, including Carla's, still use a paper-based charting system. The dialysis centers are part of a private consortium and are not affiliated with SouthWest Medical. The dialysis centers employ their own staff and physicians, and they have their own electronic medical record that is not linked to that of SouthWest Medical.

Case Analysis

Use the following outline to complete an in-depth case analysis. To learn about fishbone diagrams, see Patient Safety 104: Root Cause and Systems Analysis.

1. Overall Process Map
    - For Carla's care in this case study, draw a picture or a diagram of the overall care process. Flowcharts and stick figures both work very well.
    - Show the major steps in her story.
2. What contributed to this adverse event?
    - From the overall care process map, create a list of things that went wrong in the care experienced by Carla and her providers. These do not need to be in any particular order.
    - Group these problems and errors into sensible categories. Examples include "communication breakdown" and "equipment failure."
    - Use the "ask why five times" method and/or a fishbone diagram to organize your thinking. (To learn about fishbone diagrams, see PS 104: Root Cause and Systems Analysis.)
3. Create Rules for the System
    - Read "Redesigning Health Care with Insights from the Science of Complex Adaptive Systems."
        - To download this free article, go to the Institute of Medicine's Crossing the Chasm page.
        - Click "Download Free PDF."
        - Enter your information and click "Continue."
        - You'll be directed back to the original Crossing the Quality Chasm page. Select "PDF Chapters." Click "Appendix B: Redesigning Health Care with Insights from the Science of Complex Adaptive Systems."
        - Open or save article.
    - Based on this article, create one or more simple rules that might guide the development and evolution of Carla's ideal health care system.
4. The Ideal Process Map
    - Based on the rule(s) you just developed, draw a picture or a diagram of the ideal overall care process for Carla. Feel free to use diagrams or a process map here rather than text.
5. Improving Part of the System
    - Identify at least one process in Carla's case that, if improved, could have moved Carla's care closer to the ideal.
    - For each of the processes you identify, create an aim statement for improvement.
        - A good aim statement specifies "how good, by when, for whom."

6. How would you know the changes made a difference?
    - Suggest measures that could be used to
        - Track the progress of your improvement effort (process measures)
        - Assess the impact of improvement on the targeted population (outcome measures)
        - Monitor the costs associated with improvement (balancing measures)
7. What changes will you make?
    - What changes in the current system of care would you recommend testing? (i.e., are there small-scale, incremental changes that would be beneficial? Are there new care processes that need to be designed and implemented?)
8. Plan Your Tests
    - Provide a plan to test the changes you have proposed.
        - What questions do you hope to answer with this test, and what do you predict the answers are?
        - What changes will be tested?
        - How will the changes be tested (consider small scale early)?
        - Who will run the test?
        - Where and when will the test take place?
        - What information is important to collect?
        - Why is it important?
        - Who will collect the data?
        - Who will analyze the data prior to study?
        - Where will data be kept?
        - When will the collection of data take place?
        - How will the data (measures or observations) be collected?
9. What challenges might leadership face?
    - What obstacles might the organization's leaders need to overcome in order to implement your suggested changes?
    - How could you help leaders overcome these challenges?