

Quality Improvement: Challenges Related to Transitioning From Hybrid Documentation Model
to Exclusive EHR

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Abstract

This project assessed the various barriers to implementation of an exclusive EHR documentation system in the small clinic. The project focused on encouraging the use of existing EHR and to empower the employees to help sustain the change. Evaluation of the history of the clinic's documentation system was made, which revealed that the clinic moved from paper to an EHR and paper (a hybrid) documentation system in the previous 12 years. Literature review was conducted to reveal the likely barriers such as human behavioral factors, leadership factors, and organizational factors. Shadowing experience in exclusive EHR documentation clinic was provided to staff. Analysis revealed staff exposure to exclusive EHR documentation system, led to staff attitude improvements from resistance to acceptance of exclusive EHR. Analysis of variation of paper and EHR patient records revealed 8% discrepancy of lab result entry as well as 23% discrepancy in dose documentation entry. Calculated cost for non-value-added material was \$651.46 annually. Extrapolated annual labor cost of clinic staff for time spent handling the paper documentation equaled to \$27,696.12 Identification of barriers and collaboration improved staff acceptance of the acceptance of the EHR adoption. De-implementation of a non-value-added process from healthcare setting improves patient safety, healthcare information sharing, and reduces waste.

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Problem Description

Twelve years after EHR adoption by a macro-institution, a small embedded medical clinic continued to have resistance to exclusive use of EHR. Even though the macro-institution facilitated adoption of EHR throughout the system, the clinic's transition to EHR was not fully followed through. This left the clinic in a perpetual transition state, using both paper and EHR simultaneously. This practice of using both paper and EHR simultaneously will be referred to as a hybrid system. This problem, having a hybrid system, is multifactorial and includes staff resistance to change, perhaps lack of personal competency, technical deficiencies, delayed, organizational response.

The clinic's practice of using a hybrid system is not maintained for any tangible reason, but rather held-over practice from a pre-EHR era. Transitioning to EHR had already occurred in the clinic, but de-implementation of the old hybrid paper system never took place. Recognizing the advantages of an EHR-only system, five clinic managers over the past 12 years tried unsuccessfully to de-implement the hybrid system. The purpose of this project was to better understand barriers to adaptation of an EHR-only system and steps to overcome those barriers.

Available Knowledge: Literature Review

Literature search was conducted in PubMed, Scopus, PsycINFO, Google Scholar, and web sites for the United States Health and Human Services (HHS), Center for Medicare and Medicaid (CMS), and American Health Information Management Association (AHIMA). Relevant literature/topics evolved as the project needs were identified. These included pros and

cons of hybrid HER, human factors as barriers to EHR implementation change, and effective/ineffective change leadership.

Pros and Cons of Hybrid: Safety and Cost

A large body of research demonstrates the multiple advantages to exclusive EHR use and points to unnecessary difficulties created by hybrid system use. The benefits of EHRs include patient care quality improvement, healthcare cost containment, record portability as the patient moves from system to system, enhanced utilization of evidence at the point of care, and increased reliability as compared to paper-based systems (Adler-Milstein, Salzberg, Franz, Orav, Newhouse, & Bates, 2013; Gardner & Sparnon, 2014; Kazley, Simpson, Simpson, & Teufel, 2014; Kumar & Wambugu, 2015). Use of EHR systems permits linkage of the patient's appointment procedures, provider notes, orders, referrals, and the international statistical classification of diseases (ICD) code, leading to increased billing for revenue; which is impossible to achieve with paper records (Adler-Milstein et al. 2013; Kazley et al. 2016; Kumar & Wambugu, 2015).

EHR utilization is linked to significant healthcare cost savings. According to Blumenthal (2009), the United States federal government claimed savings of \$33 billion over a decade by converting the Medicare and Medicaid programs to electronic health systems. With widespread EHR adoption, Hillestad et al. (2005) estimated a potential savings of over \$77 billion annually while improving patient safety and efficiency. Thus, these overwhelming benefits of EHRs—and having an already existing EHR system in the organization—should urge the clinic to completely transition to using EHR exclusively.

Hybrid documentation workflow could lead to unsafe patient care. According to Gardner and Sparnon (2014) using hybrid documentation system which could come as organizations

remain in an indefinite limbo period between paper and EHR or a hybrid workflow that can come as part of a transitional period, or which can be an “unintended workaround” in the form of supplementary handwritten notes, printouts, and shared materials, creates a safety hazard—as vital tasks were often accidentally-omitted in the dual mode records—leading to oversights and patient safety risk for medical errors. As analysis by Makary and Daniel (2016) argued that medical error in the United States was the third leading death, and documentation oversight that creates patient safety hazard amounts to potential or actual medical error. Moreover, the duplication of tasks in such a setting often decreases efficiency and drives down quality of care and leads to waste (Gardner and Sparnon, 2014).

Factors Implicated in De-implementation

There are multiple challenges that lead to the delay in transitioning to exclusive EHR use. These challenges include human factors (employees/staff/providers resistance to change), ineffective change leadership, and the difficulties with de-implementation of the old way of doing business when switching to new innovations

Resistance to Change

The most common barrier to change in any organization is human-behavioral factors; this was the case with regards to EHR de-implementation at the clinic referenced here. These human behavioral resistance factors may include belief in an unpredicted downside, feeling of loss of control, or feelings of discomfort with change (Dubois, Bentein, Mansour, Gilbert, & Bedard, 2014). Additional studies reveal that employees with longer duration of employment and greater experience at an organization show greater levels of resistance to exclusive EHR use because of fear of losing independence in their practice as compared to pre-EHR (Barrett, 2018; Williams, Shah, Leider, & Gupta, 2017). Ajami and Bagheri-Tadi (2013) discussed that difficulties to EHR

adaptation in part due to provider change resistance, since providers are frontline users and likely a powerful group to influence the other groups in their team. Ser et al. (2014) claimed that it is not the EHR system itself, rather it is the organizational culture's inability to navigate the technology that leads to barriers. Thus, it can be asserted that these human behavioral and cultural factors lead to maintaining hybrid documentation systems such as what this project had address.

Leadership, Change Management, and Organizational Factors

Change is dynamic and requires a shift in paradigm in that the individuals affected by the change have to agree to move from 'the way things are' to a 'new method. Transitioning to exclusive EHR is a major change for employees and major challenge for organizations because all stakeholders including individual or groups of employees need to accept the change and shift to adopt using the EHR, which is not always the case.

Ubel and Asch (2015) discussed "de-implementation" of the older and resource-consuming practices where new innovations did not replace old technologies, but rather were used simultaneously — "the problem wasn't that new innovations weren't adopted by the organization but it was that the old ways weren't de-adopted." Change leadership and approach plays extremely important role in effective transition from previous state to current state of change (Upvall, M.J., & Bourgault, A.M. (2018). According to Donnelly, (2017) change that is managed with framework and structured approach is likely to succeed because the structure would facilitate identification of the issues and means of issue resolution. Issues that arise during change process that are not handled by a 'designated owner/manager' are unlikely to self-propel to move the change forward (Donnelly, 2017), nor informal and ambiguous communications that

are not clear lead to desired change (Barrett, 2018). Therefore clear and focused management is desirable for successful change to occur.

Findings from Longenecker and Longenecker (2014) are highly relevant to that of the small clinic that is currently the subject of this project. After the initial implementation of the EHR more than 12 years ago, the small clinic staff did not receive ongoing feedback as if that change was simply forgotten or did not take place. There was no accountable leader available to offer training support or encouraged the staff towards exclusive EHR. The implementation leaders, it seems, did not go back and reevaluate the success of the initiative and intervene. Failing to give feedback is one of the top reasons for unsuccessful change (Longenecker and Longenecker, 2014). This quality improvement project was an attempt to complete the change that was started in 2007. However as Longenecker and Longenecker, (2014) explained, once change stall or fails, going back and making adjustments and reattempting the same change take time and waste resources. This explanation resonate with the current project as the project was a reattempt of a previously implemented but incomplete change.

Frameworks, Models, and Concepts Used

For such a task the most appropriate change theory is Lewin's change theory (Crowell, 2016). Lewin's change model's concept of unfreeze-change-refreeze Crowell, (2016) seems appropriate to utilize for this specific problem of de-implementing the paper workaround from the clinic. Lewin's unfreeze state helps the staff evaluate their current practice and gain a new perspective and be open to learning improved ways of practice. Once the staff members are ready, through the dynamics of change implementation, the staff will proceed through Lewin's second change state (movement) and in due time will start using EHR exclusively while avoiding paper workarounds. Once change is made, the success will be measured by its sustainability

based on Lewin's refreeze state—where staff members continues to grow and learn additional new information. In the proposed change, Lewin's 'refreeze' phase will be maintained through staff training to a new and improved EHR software, and providing a super-user individual in the clinic to help staff whenever help is needed (Crowell, 2016).

This project utilized unstructured conversation with the clinic staff in order to understand the human factors, associated barriers of the clinic, and collected data on staff experience, meanings, and attitudes towards change. For each identified barrier, the quality improvement project used the Plan-Do-Study-Act (PDSA) Cycle method to propel the proposed change improvement to the next level, towards the desired change. Each PDSA cycle explored situations by drawing from literature that utilized frameworks of social, behavioral, organizational, and leadership roles surrounding change and barriers to change. The PDSA Cycle allows for breaking down the various parts of the change process and completing each one diligently without overwhelming the process.

Purpose of the Project

The purpose of the proposed quality improvement project was to facilitate de-implementation of the paper portion from the hybrid documentation system the clinic currently uses. Based on the overwhelming evidence that EHR use supports patient safety and improved outcomes, the central question was what are barriers to adaptation and what are the best strategies for reducing the stakeholders' resistance towards implementation of EHR exclusively? The anticipated effect was to understand the barriers and develop strategies that could potentially help align the clinician's ideology with that of the organization, and address their needs by allowing them to fully engage in the decision making process ,resulting in clinic-wide adoption

HER-only documentation. Acknowledging the staff needs and engaging likely could facilitate a decline in their resistance to exclusive use of the EHR, abandoning the hybrid system.

Context

This clinic is a micro-system affiliated with a large macro-system that provides the largest portion of healthcare in the state of Oregon. The macro-system began transitioning to the EHR documentation system since the early 2000s. The small clinic transitioned to EHR in 2007 but also kept the old paper system to date. Several managers passed through the clinic in the past. The current manager has been in place less than a year and is fully supportive of de-implementation of paper documentation system as soon as possible, setting a tentative goal for 6 months.

The staff acceptance of exclusively going to EHR and the clinic management has a direct impact on this project's intervention and outcome. The small clinic employs two nurse practitioners (NP) who provide direct face-to-face patient care and two registered nurses (RN), who telephonically provide patient care and do the care coordination. One medical assistant (MA) mainly provides direct patient working with the NPs. The clinic provides anticoagulation therapy management to large patient population. All but the clinic manager use the hybrid documentation system. One RN and one NP have been at the clinic for over 25 years. The other three employees have been at the clinic for 4 to 12 years.

Intervention

The groundwork for change has been laid for years before this author began fully exploring this project. The first intervention was sending staff for a shadowing opportunity in another clinic using EHR exclusively, employing active learning. A second intervention was encouraging collaboration between staff at varying levels of resistance by holding regular staff

meetings, coordination with clinic manager and IT specialists, and health record integrity personnel. A third intervention included conducting a lab result and dosing entry record review to evaluate for discrepancies between records in the paper compared to the EHR records. A final intervention included, keeping a month long log of time spent by the staff on paper portion and calculation of time and materials cost on non-value-adding documentation work.

Several staff meetings were held to engage the team in the process of moving the project forward from where it was left at initial EHR adoption. Two staff members from the clinic attended a day of shadowing at a different clinic that uses EHR exclusively, as it is believed that shadowing is believed to promote active learning (Clark, 2017).

Secondly, data on materials purchased and staff labor costs accrued while double-documenting using the paper system was collected for the month of February 2019. Thirdly, one hundred entries from 20 randomized paper charts compared for entries in the same records in the EHR and data gathered in an excel table format document.

Lastly, weekly meetings were held which included discussions of transitioning to EHR-exclusive, experience related to shadowing EHR-only clinic, and error and expenditure analysis results. A final meeting occurred between clinic staff, manager, IT team, hospital patient safety expert, and department head of the hospital health record integrity to discussion the next step in the exclusive EHR for the clinic.

Study of the Intervention

The project planned and measured the effect of the intervention on the staff perception, attitudes, and the influence on transitioning to exclusive EHR acceptance. The project engaged other departments and individuals from the macro system as team members that would aid the clinic make the implementation/de-implementation, training, and sustainability of the change to

avoid relapse to utilizing paper workarounds. The project measured cost in terms of personnel/labor and of materials cost of the none-value-adding documentation portion of in the hybrid system in United States dollar amounts.

Measures

To measure staff attitude and acceptance to exclusive EHR use in response to the clinic shadowing experience, an informal pre-and-post shadowing conversations were held with all staff to inquire about their experience and if that experience had an impact in how they feel about the clinic's intended change. The indirect measure was to appreciate if staff members were willing to use the EHR exclusively, once they were exposed by their shadowing experience. The second indirect measure was achieved through asking questions and gathering answers of 'yes, maybe, or no' from administration and IT specialists in supporting the clinic staff's desire for updated EHR module. This was done during formal meeting with the clinic manager.

There are costs in time and materials associated with keeping the hybrid system. Therefore, in order to measure the costs of the materials for maintaining the paper system was measured through compiling data from 18 months (spanning 6/2017 to 11/2018) of clinic purchasing lists of toners, whiteouts, printing paper, and manila folders. To account for staff time spent on paper workarounds or duplication, a time measurement log for two NPs {(labeled LIP 1 and LIP 2) (appendix ii)}, one RN, and one MA daily activity was prepared and maintained for February 4, 2019 through March 1, 2019. For the cost to purchase the material used in making the paper charts, the average annual expense was extrapolated using the available data and the cost was shown in dollar amounts for the length of the hybrid system in the clinic (appendix iii). Using publicly available salary data and matched with the experience level of the clinic staff, an extrapolated labor cost was shown in United States dollar amounts (appendix iii).

Analysis

This change to exclusive EHR is important for a number of reasons. First, the analysis of documentation records revealed discrepancies of the between the paper and the EHR system. Secondly, the informal team meetings were analyzed for staff attitude and acceptance to the exclusive EHR. Third, staff shadowing in another EHR only clinic was effective at helping staff become accepting of the change. The staff attitude change can be explained in terms of Lewin's 'unfreeze state' as staff gained a new perspective leading to acceptance of change (Crowell, 2016). Fourth, cost analysis for materials consumed in the clinic for paper documentation and time related professional labor cost was analyzed and reported. Finally, change did occur in that several teams were engaged, such as the clinic staff, the IT team, administration, and the health record integrity administration department. Management was essential in bringing the team together to make the transition to the new EHR module in the near future. This report was prepared independently, though no formal strategies for assuring validity were incorporated in collecting or analyzing of data or results. This author acknowledges that natural biases exist and note personal biases.

Ethical Considerations

Healthcare has an ethical mandate to provide safe, cost-effective care which includes the de-implementation of non-value adding practices such as hybrid documentations systems. The project does not require review and approval from an institutional review board (IRB), however the individual leading the project has obtained the certificate form the collaborative institutional training initiative (CITI) prior to the proposal of the project. The project does not include any identifying data, though knowledge of the organization involved could be extrapolated. Informal interviews and discussion and answer were voluntary. No rewards or consent were implemented.

Results

As of the time of this project report, four out of the five clinicians in the small clinic use the current hybrid system and one clinician has completely transitioned and using EHR system exclusively. At the start of the project the hospital's record integrity team was invited to the clinic after a meeting with the clinic manager. They identified the lack of confidential storage of the paper records in two of the five clinic rooms. This resulted in providing all staff with door keys to those rooms so to keep these records safe from being accessed by other than authorized personnel. Two of the five staff returned from a shadowing experience and shared their feelings about exclusive EHR use and their observation of the system at which they shadowed. The result of the shadowing led to a change in staff willingness to use the exclusive EHR when the planned upgrade happens. Their willingness to accept EHR-only system has led to engaging the hospital system's IT department to start the EHR upgrade; at the present time, this is scheduled to occur in the next 3-6 months.

The analysis of record discrepancies, material, and labor cost contributed the change of staff's willingness to the exclusive EHR and other stakeholders to collaborate and help bring the change. Directly comparing the discrepancy in the data entry in the paper and in the EHR from the same visit, same day, and same record, revealed an 8% discrepancy of lab result entries as well as a 23% discrepancy in dose documentation entries. When presented to the team, this finding highlighted a potential safety issue that can be avoided by going to exclusive EHR documentation. The review of material costs and the clinicians' time spent on paper workarounds, revealed the total cost on non-value-added care. The calculated annual cost for non-value-added material was \$651.46. The extrapolated annual labor cost of clinic staff for time spent handling the paper documentation was calculated as \$27,696. This result and all findings

impacted the final decision to move the clinic's EHR module upgrade forward and finalized the decision to move to exclusive EHR use at the time of upgrade to sometime soon in 2019.

Summary

In summary, the proposed de-implementation project is time and resource consuming (Longenecker and Longenecker, 2014). The same clinic staff that were there at initial EHR implementation 12 years ago informally discuss memories and experiences they encountered at initial EHR implementation in 2007. These senior clinic staff exert informal leadership/power as they engage in influencing communication with newer staff members and encourage the paper workarounds during new staff orientation. This communication may lead to recruiting the newer staff in engaging in the workarounds. According to Barrett and Stephens (2017), this type of communication amongst new and senior staff, tolerated by administration, perpetuated paper workarounds resulting in the current hybrid system of documentation.

The proposed paper documentation de-implementation project heavily relies on effective management. At the initial implementation in 2007, the change leadership approach may not have provided a formal roadmap to the de-implementation of the paper portion of documentation in the clinic. It is suggested that major decisions and deeper change in a larger organization are better handled by guiding employees through a structured change process led by leadership, and *not* making the decision making process through consensus (Ejimabo, 2015). Leadership greatly impacts change processes in organizations. For example, a change leader with a "top-down" communication style may cause employees to perceive fear, anxiety, or threat which could lead to dislike, discomfort, and lack of conviction to intended change (Vos & Rupert, 2017). Individuals interpret the same phenomenon differently based on their values; a leader and frontline workers may evaluate change differently and react accordingly. Thus, change

managers must be sensitive to all stakeholder anxieties and ease the process by allowing opportunities to evaluate the complexity and usefulness of the technology in important areas of patient care, safety, and cost savings.

Interpretation

Smaller groups may seem more facile/able to be flexible and adapt to change, however, that was not the finding during this project. With a small number of participants working closely together, with some embracing the change and some not, the process of change creates an awkward working relationship that sometimes may lead to communication challenges amongst the staff. By bringing all the stakeholders together and collaborating with the entire team, the staff went through Lewin's unfreeze stage of change (Crowell, 2016) whereby acceptance of the change to exclusive EHR occurred. Currently, the entire clinic staff is in agreement and awaiting the upgrade and de-implementation of the intended paper workarounds. Additionally, the team that was engaged to assist the clinic in moving to the de-implantation of the paper portion of the documentation was provided with sufficient information to develop a business case which they presented to the decision-making committee so that the clinic's need for IT support and EHR upgrade was approved. Seemingly, the leadership has proved effective in furthering the change process through engaging all stakeholders, including the clinic staff.

Limitations

A major limitation was a lack of formal methodology for data collection and analysis. Therefore the types of questions and answers could have varied greatly from individual to individual, according to the question asked. The team meetings were informal, with no private place for discussion/interviewing. Thus, this lack of uniformity and formality may have resulted in the current finding as supposed to some other finding had the questions were uniform, the time

and place formalized. This specific project may not be generalizable as this author is not aware of other major anticoagulation clinic uses hybrid documentation systems; however resistance to change is ubiquitous. PDSA cycles to understand resistance and steps taken in an attempt to address that resistance could be applied to most quality improvement clinical projects. Finally, personal bias on the side of this author regarding the underlying problems of having to engage in the ‘intended workarounds’ or having to do work that is not value-added may have coerced some staff members to agreeing with the de-implementation despite their desire otherwise.

Conclusions

The literature has rich evidence on the benefit of EHRs as well as what causes change impedance in healthcare settings and in particular with implementation of EHRs. What is lacking from the literature is the rate of clinics or clinicians using hybrid systems. In this realm, further inquiry is needed to elaborate on the prevalence of the issues described in this project report.

The intention of the project was for the clinic to fully implement the EHR in an effort to ensure patient safety and cost reduction by avoiding waste, which is currently in process. The next step in this project is bridging the implementation of the current clinic’s EHR system upgrade and de-implementation of the paper workarounds with adoption of a clinical virtual visit system on the same module. In an effort to reduce the tendency to revert back to previous documentation methods, the final steps will be revisiting the clinic staff with a more formal approach and methodology to conduct a post-implantation evaluation of the workaround, workflow, staff satisfaction/dissatisfaction, acceptance of exclusive EHR work conditions.

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Appendix i

comparison of entries between paper & HER for discrepancies

Date/R #	In EHR result INR/electronic	EHR ACC FS tabulated	Paper cht INR tabulated	In/out of range	Plan in EHR	Plan in paper cht	Note
10/18/2018	3.5	2.6	3.5	Out	4MTuW FSS 2Th	4daily 2mg Th	Different INR result
10/4/2018	2.2	2.2	2.2	Out/Low	4 MWSS 2M 0ThF	4 QD 2Mon	Different dose
9/27/2018	5.3	5.3	5.3	Out/High	Same	Same	Confusing
8/30/2018	3.1	3.1	3.1	In range	Same	Same	Clear
8/6/2018	2.5	2.5	2.5	In range	Same	Same	Clear
9/16/2014	missing-	2.5	2.5	in	Same	Same	INR missing where most look
9/2/2014	missing-	1.9	1.9	Low/out	Same	Same	INR missing where most look
8/25/2014	missing-	2.1	2.1	In	Same	Same	INR missing where most look
8/18/2014	missing-	2.7	2.7	In	Same	Same	INR missing where most look
8/11/2014	2.8	2.8	2.8	In	Same	Same	INR missing where most look
10/17/2018	2.7	2.7	2.7	In	Same	Same	Outside lab
10/3/2018	2.5	2.5	2.5	in	Same	Same	
9/19/2018	2.2	2.2	2.2	in	Same	Same	
9/4/2018	2.6	2.6	2.6	in	Same	Same	
8/27/2018	2.5	2.5	2.5	in	Same	Same	
10/29/2018	1.4	1.4	1.4	Low/Out	Same	Same	
10/12/2018	2.6	2.6	2.6	in	Same	Same	
10/2/2018	3.2	3.2	3.2	in	Same	Same	
9/19/2018	2.5	2.5	2.5	In	15 x 1 15 MWF 10TuThS S	?? 15MWF 10TuThS S	The 1x dose is missing

9/12/2018	1.9	1.9	1.9	Low/Out	15 x1 15MWF 10TuThS S	?? 15MWF 10 TuThSS	The 1x dose is missing
8/23/2017	3.1	Not there	3.1	High/Out	Not there	--/--	Dosing??
7/24/2017	2.7	2.7	2.7	In	5MwThS S 2.5TuF	--/--	Dosing??
6/29/2017	2.6	2.6	2.6	In	5MwThS S 2.5TuF	--/--	Dosing??
5/9/2017	3.1	3.1	3.1	High/Out	2.5x1(even if) 5MwThS S 2.5TF	--/--	Dosing??
4/12/2017	2.4	2.4	2.4	In	5x1(even if)? 5MwThS S 2.5TF	--/--	Dosing??
5/23/2017	2.1	2.1	2.1	in	5QD 2.5TuTh Sa	---/---	Dosing??
4/18/2017	2.2	2.2	2.2	in	5QD 2.5TuThS a	---/---	Dosing??
3/28/2017	2.8	2.8	2.8	In	Same	Same	
3/22/2017	1.4	1.4	1.4	Low/out	7.5X1 5MwThS S 2.5TuFri	7.5x2 5x1, 2.5x1,5x1 ,2.5x1	Difference in dose
2/22/2017	1.5	1.5	1.5	Low/out	Same	Same	
10/18/2018	2.5	2.5	2.5	In	7.5MWF Su 10TuThS a	---/---	Dosing??
9/19/2018	2.5	2.5	2.5	In	7.5MWF Su 10TuThS a	---/---	Dosing??
8/22/2018	1.9	1.9	1.9	Low/out	Same	Same	
7/12/2018	2.4	2.4	2.4	In range	Same	Same	
6/14/2018	3.9	3.9	3.9	High/out	Same	Same	
4/12/2018	4	4	4	High/out	0x1 3MTuW RhFSS 3.5Sun	missing 3MTuW RhFSS 3.5Sun	Dose is different
3/1/2018	2.7	2.7	2.7	In range	Same	Same	
1/18/2018	3.4	3.4	3.4	In range	Same	Same	

12/20/2017	2.5	2.5	2.5	In range	Same	Same	
11/9/2017	3.8	3.8	3.8	High/out	Same	Same	
10/4/2018	3.5	3.5	3.5	High/out	Same	Same	
9/20/2018	3.5	3.5	3.5	High/out	Same	Same	
9/11/2018	2.8	2.8	2.8	In range	Same	Same	
8/1/2018	3.7	3.7	3.7	High/out	Same	Same	
7/10/2018	3.1	3.1	3.1	High/Out	7MTuWT hFSu 6.5Sat	---/---	Dose difference
3/16/16	2.4	2.4	2.4	In range	Same	Same	
1/13/2016	1.8	1.8	1.8	Low/out	- 7.5MWT hSS 10TuFr	10x1 7.5MWT hSS 10TuFr	Different dose
12/23/2015	2.2	2.2	2.2	In range	7.5 MWFSat 10TuTSu	---/---	Different dose
12/16/2015	2.6	2.6	2.6	In range	7.5x1 7.5MWT hSS 10TuF	---/---	Very Different
11/30/2015	3.4	3.4	3.4	High/out	Same	Same	
11/7/2017	6.6	6.6	6.6	High/Out	0x1 2.5 MTWTF SS	0X2 2.5Q D, vit K	Dose is different
10/26/2017	--	5.1	5.1	High/Out	Same	Same	
10/16/2017	--	2.8	2.8	In range	2.5 daily 5MFr,	2.5 daily 5MFr, vit K	
9/20/2017	3.6	3.6	3.6	High/out	2.5MWT hFSu 5TuSat	---/---	?
8/25/2017	3.1	3.1	3.1	High/out	Same	Same	
10/15/2015	2.6	2.6	2.6	In range	Same	Same	
9/10/2015	2.5	2.5	2.5	In range	Same	Same	
8/13/2015	2	2	2	In range	Same	Same	
7/30/2015	2.7	2.7	2.7	In range	Same	Same	
7/2/2015	3.3	3.3	3.3	High/out	Same	Same	
10/18/2018	1.3	1.3	1.3	Low/out	Same	Same	
9/10/2018	1.8	1.8	1.8	Low/out	Same	Same	
8/29/2018	1.5	1.5	1.5	Low/out	Same	Same	

7/31/2018	1.5	1.5	1.5	Low/out	Same	Same	
7/9/2018	1.6	1.6	1.6	Low/out	Same	Same	
10/25/2018	>8.0/5.25	5.25	>8poc/5.25L	High/Out	0 x1 0 Th, F 7.5 Sat, Su	0 x2, 7.5x2	??
10/18/2018	2.5	2.5	2.5	In	7.5 TuWThF SS	7.5 TuWThF SS	

% of INR entry discrepancies: 8%

% of dose entry discrepancies : 23%

Appendix ii

Hybird system paper chart making material expense and cost													
Date	42892	42832	42956	42985	43052	2017 TOT	43124	43168	43216	43256	43334	43384	2018 TOTAL
HP Toner	115.99		120.99				126.99	126.99		126.99	107.89		
Copy pap	33.28			33.28	33.28				33.28		33.28		
Manila folders		11.76			11.76		11.76						
White outs			11.28		6.74			5.64	19.12			6.89	
Total	149.27	11.76	132.27	33.28	51.78	378.36	138.75	132.63	52.4	126.99	141.17	6.89	598.83
Average annual paper chart system related	\$651.46/year												
average cost over the past 12 years of pap	7817.52												
	(378.36+598.83)/3=325.73												
	325.73 x 4=1302.93												
	1302.93/2=651.46												

Appendix iii

Study of time spent on using paper charts in the hybrid system by staff February 2019							
Date		LIP -1		LIP - 2		RN	MA
2/4/2019		12minutes		19 Minutes		90 minutes	30Minutes
2/5/2019		8 minutes		11 minutes		100 minutes	42 minutes
2/6/2019		12 minutes		25 Minutes		99 minutes	45 Minutes
2/7/2019		7 minutes		20 minutes		99 minutes	45 minutes
2/8/2019		8 minutes		N/A Out		50 minutes	22 minutes
2/11/2019		10 Minutes		23 minutes		99 minutes	35 minutes
2/12/2019		14 minutes		25 minutes		99 minutes	35 minutes
2/13/2019		9 minutes		15 minutes		99 minutes	35 minutes
2/14/2019		12 minutes		20 minutes		99 minutes	25 minutes
2/15/2019		7 minutes		N/A Out		50 minutes	20 minutes
2/19/2019		17 minutes		26 minutes		99 minutes	45 minutes
2/20/2019		8 minutes		22 minutes		99 minutes	45 minutes
2/21/2019		8 minutes		14 minutes		99 minutes	34 minutes
2/22/2019		12 minutes		N/A out		50 minutes	25 minutes
2/25/2019		10 minutes		17 mintues		99 minutes	45 minutes
2/26/2019		11 minutes		22 minutes		99 minutes	45 minutes
2/27/2019		8 minutes		15 minutes		99 minutes	25 minutes
2/28/2019		14 minutes		20 minutes		99 minutes	40 minutes
3/1/2019		12 minutes		N/A Out		60 minutes	30 minutes
TOTA MINUTES		199 minutes		294 minutes		1687 minutes	668 minutes
TOTAL IN HOURS		3.317		4.9		28.117	11.133
Total in ~dollars		\$242.61		\$358.39		\$1,462.08	\$244.93
Sallaries used are based on average LIP, RN, MA sallaries found from public record							
Monthly sallary estimate to maintain paper system to run symeltaniously with HER							\$2,308.01
Likely potential payout to staff of duplication of documentation						Annually	Annually
							\$27,697.20