CLINICAL PRACTICE

CRRT documentation education: Increasing compliance on a new electronic health record

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ABSTRACT

Continuous renal replacement therapy (CRRT) is a modality by which critically ill and hemodynamically unstable patients in the intensive care unit (ICU) can receive hemodialysis. Documentation for CRRT includes many crucial elements and contributes significantly towards the achievement of treatment goals. One of these is ultrafiltrate (UF) removal calculation, which is imperative to addressing fluid volume overload and reducing mortality. Our large academic medical center implemented a new electronic health record (EHR) that revamped CRRT documentation and was rife with opportunities for improvement. A hospital-wide survey sent to ICU staff revealed that most nurses felt they did not receive adequate CRRT documentation education, specifically tailored towards the new EHR. Review of the literature supported the notion that improvements in documentation could be made through enhanced educational offerings. The CRRT nursing curriculum was redesigned to place more emphasis on teaching the purpose and correct implementation of documenting in our EHR. The results of the educational intervention were increased confidence in CRRT documentation as well as improved competency.

Key Words: Continuous renal replacement therapy, Electronic health record, Nursing documentation, Ultrafiltrate

1. INTRODUCTION

Continuous renal replacement therapy (CRRT) is a mode of dialysis frequently employed with critically ill patients with acute kidney injury (AKI).[1] Most intensive care unit (ICU) nurses have at least baseline familiarity with this modality of treatment. This is especially true of our quaternary-level academic medical center with 1,086 in-patient beds and nine different ICUs containing over 100 critical care beds.[2] Our institution uses the Baxter PrisMax system, which was new to the institution as of March 2020 when it began to replace the Baxter Prismaflex system. However, there were significant gaps in knowledge and practice with respect to documentation surrounding CRRT identified by bedside nurses and CRRT leaders: Failure to calculate appropriate ultrafiltrate (UF) removal and document; accordingly, incorrect charting of CRRT machine number, failure to chart hourly parameters when auto-enter was not working, and failure to chart filter changes appropriately. It was clear that some part of the CRRT education curriculum needed to change to address the needs of documentation.

Nature and scope of the project

In June of 2021, we changed our electronic health record (EHR) from Sunrise Clinical Manager (SCM) to Epic Systems. This was significant because prior to the adoption of SCM in 2004 (P. Estes, personal communication, August 2,

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2022), the organization had conducted all its nursing documentation on paper; thus, this was the first change from one EHR to another that this institution had experienced. Because nursing leadership was not satisfied with the baseline CRRT documentation that Epic provided, the flowsheet was highly customized to the institution, resulting in no established education for the nursing staff. This is significant because the EHR vendor typically plays an immense role in end-user education, and due to the aforementioned situation, it was not available. A large gap existed between the current practice of nursing documentation and the ideal state, which was: Daily weight and hematocrit; hourly vital signs including patient temperature, hourly intake and outputs; CRRT machine number once a shift and with filter changes; and hourly documentation on the CRRT flowsheet of: Treatment type, treatment modality, and treatment status; UF goal and fluid balances; filter status including de-aeration chamber; continuous drip and CRRT fluid and flow rates; and CRRT machine parameters including pressures, pump rates, serial number, and cumulative weight balance. Many of these data points were omitted or documented incorrectly in the current practice, particularly surrounding the hourly UF and fluid balances.

The existing CRRT education model prior to the project was as follows: Nurses who were new to the ICU were required to take a New User CRRT course that was four hours long. It included approximately two hours of training on the principles behind CRRT and two hours of hospital-specific training, including a hands-on portion where students demonstrated loading a set. Prior to the implementation of this project, students were taught the principles of CRRT documentation without much reference to the actual EHR and simply given a handout to reference later while working on their respective units. Students were encouraged to use the "Epic Playground," a login version of Epic where all the patient information is fictitious and resets every day to allow for experimentation; however, this was not required and thus there were no CRRT-specific exercises. There is also ongoing education. All nurses who run CRRT must complete an annual web-based training module and perform an in-person competency. In addition, the institution offers a CRRT SuperUser course that explores advanced CRRT principles and teaches nurses to act as resources for their peers.

The aim of the project was to educate nurses during the new user training with the goal of bringing actual documentation closer to ideal documentation with a specific focus on correct UF calculation. Correct documentation is important because it allows for correct dosing of medications by pharmacy, helps to monitor the performance of the CRRT machine and set to review the need to change the prescription, facilitates proper billing, tracks metrics to target for quality improvement, and most importantly, helps the nurse calculate the correct amount of UF to pull to meet the fluid balance goals.[3] This is a metric frequently tracked in CRRT programs because fluid overload is a significant predictor of mortality in CRRT patients,[4] making it imperative that nurses be able to document and thus calculate it correctly. Thus, it can be argued that correct CRRT documentation, at its most dire, may represent the difference between life and death for some patients.

Nurses are in a unique position to influence proper UF removal because they perform the minutia of the hour-to-hour calculations, since making these calculations for an entire population of ICU patients on CRRT would be far too cumbersome for the Nephrology team. This level of consequence brought the project up in priority and leadership agreed to fast-track this project to be implemented in a short (6-week) timeframe. This quality improvement project is the first of its scale to be attempted without EHR vendor support, to the knowledge of the authors.

2. DESIGN PROCESS

It was evident that there was a myriad of aspects of this project to consider. A needs assessment was conducted to ascertain which aspects of the education should be modified. After this, a review of the literature was undertaken to assess which methods may be most successful in modifying nurses' documentation behaviors. Next, a course redesign took place with knowledge gained from the prior two activities. A pilot class was recruited to test out concepts from the new content, followed by minor modifications. Finally, the day came for the first fully modified new user class in which the educational content was delivered, complete with a pre- and post-course assessment. Based on feedback from learners, the new content was adopted and continues as part of the CRRT education curriculum, and the new documentation-specific portion has been delivered to all existing staff in the form of in-person competency demonstrations and web-based training, both of which are required annually. Because the project was classified as a quality improvement project, it was deemed exempt from institutional review board. The steps are detailed below.

2.1 Needs assessment

A survey regarding CRRT was sent using Qualtrics to all the ICU managers to distribute to their nursing staff, a population of 727 as of July 11, 2022 (E. B. Serber, personal communication, July 11, 2022). Unfortunately, there was no way to omit non-nurses from the email, which probably numbered about 150, leaving 577. Only nurses who ran CRRT were

instructed to take the survey. It was held open for eight days and total of 112 responses were returned (19.4% response rate).

The barriers cited from most common to least common were: Unsure of what to do when auto-enter not available, not enough time to complete documentation, belief that documentation was too time-consuming, being unsure of what the numbers mean, not understanding how to enter the data on the flowsheet (syntax), not knowing where to find the data for charting, and not remembering how to add the CRRT flowsheet to the documentation template. About 51% of respondents stated that the amount of time devoted to documentation in their new user class was just right, as opposed to about 40% stating too little, 6% stating too much, and surprisingly 3% stated it was not covered entirely.

When asked what they did when the hourly fluid removal suggestion was incorrect, 68% stated they simply ignored the number and pulled what they felt was appropriate based on their personal calculations. Another 23% said they reset the flowsheet in some way, while only 9% stated they asked the nephrology or primary provider team what to do. When asked which educational format they would find the most helpful, 47% wanted a "quick tips" handout or flyer, 25% wanted a narrated video of correct CRRT documentation, 17% wanted an in-class presentation during annual competencies, and 11% wanted a web-based training module.

There was one more question concerning CRRT documentation that was a free text response. It asked if there were any comments that they cared to share about CRRT documentation, and the question was optional. A total of 32 (27.8%) of respondents opted to give feedback (other than some variation of "N/A".) Analyzing these responses revealed several things. One was that nurses elaborated on responses from previous questions, e.g., explaining why they answered a question a certain way. Of the responses, 7 were positive, 13 were negative, and 9 were mixed or neutral as rated by this author. Positive responses centered around: Stating the system was adequate as it was, that they felt well-educated, or that they were receptive to more education. Negative responses included: Frustration at the perception that the flowsheet is not working, frustration around other nurses documenting incorrectly and "breaking" the flowsheet, perception that the amount of documentation was too demanding, disagreement with switching to the new EHR, or criticizing the perceived lack of training involved in CRRT documentation.

2.2 Review of the literature

An informal review of published information on nursing documentation improvement strategies as well as educational methods was performed. Databases consulted were the Cumulative Index for Nursing and Allied Health Literature (CINAHL) and PubMed using the search terms (("Clinical documentation" OR "documentation") AND "nursing") AND ("compliance" OR "outcome*") and a second less formal query including the terms (("healthcare education" OR "nursing education") AND ("CRRT" OR "continuous renal replacement therapy")). Both queries were limited to works published five years prior, as well as full-text availability, being peer-reviewed, and in the English language. Irrelevant and duplicate articles were excluded, and relevant additional sources discovered through the readings were included as necessary. The final results were the six most useful sources regarding clinical documentation and the four most useful sources regarding healthcare professions education.

Some patterns were uncovered in the review. A common feature of most literature that concerned education on nursing documentation was concern about the lack of high-quality studies that addresses this need.[5–7] The majority of papers reviewed were either not specific to nurses or focused on the academic training rather than professional practice and development where the intervention was aimed. CRRT is a specialized treatment modality and other than basic principles it is unlikely to be covered in undergraduate nursing education,[8] making this particularly challenging for the project. Another repeated sentiment was that nurses display much reluctance to engage with documentation, particularly if they do not understand its relevance to their clinical practice.[7,9–12] Efforts to highlight its importance may be effective at improving a general reluctance towards increased charting requirements. Lastly, most studies showed that a multi-modal and longitudinal approach were superior at creating effective learning.[6,7,13] Educational strategies that applied to this project included performing a pre and post-intervention assessment,[5,14] including communication-based affective content to increase caring,[15] and including personal feedback.[6]

2.3 Course redesign

Based on the deficiencies identified by nursing leadership, results of the survey, and discoveries from the review of the literature, the CRRT new user course was redesigned to allow more time to devote to documentation specifically in Epic. Prior to this project, the first two hours explored basic principles to CRRT including purpose, relevant populations, solute transportation mechanisms, CRRT modalities, filter sets, access catheters, regional anticoagulation, and adverse effects. The next hour was devoted to loading the filter on the set by each individual learner. After that, about 45-minutes were spent reviewing the operations screens and demonstrat-

ing troubleshooting. Finally, the last 15 minutes of the class overviewed documentation.

The redesign acknowledged that since learners were not going to be allotted more time to take the class, it would come at the expense of existing material. Therefore, changes were made to minimize this impact. First, as much Epic-specific information including actual screen captures were incorporated into the first two hours. For example, the CRRT prescription brought into the portion on CRRT dosing. Secondly, some content had to be cut entirely. An example of this was a portion of the lecture that had been previously devoted to discussing CRRT on patients positive for coronavirus disease of 2019 since this information was no longer novel and well-disseminated during personal protective equipment content in general nursing orientation. Other content cuts were harder to make, such as devoting less time to loading and priming the CRRT set. This decision was ultimately made because the CRRT educator felt that the color on-screen instructions for the PrisMax system were easy to follow and that instead of everyone going through the entire process it would be permissible to boot up the system and enter prescription settings as a group. Everyone still loaded the basic filter set.

With these changes made, an additional fifteen minutes were freed up for uninterrupted time devoted solely to documentation in Epic including UF calculation, which gave a total of 30 minutes, or 1/8th of class time. It was not feasible to let students demonstrate actual charting in Epic due to the lack of availability of a nearby computer lab, plus the transition from classroom to computer lab would consume additional time and break concentration. Instead, teaching methods utilized included lecture of the material, demonstration of data entry on-screen in the Epic Playground, and polling of the learners when asking questions about calculating UF (instead of passively presenting an example and giving the answer, learners were asked to jot down their answer and share when done). For the in-class handout, the slides concerning documentation in Epic were enlarged (two per page) so that they could be referred to with more clarity later, as physical layout of slides has been demonstrated to enhance learning.[16] In addition, minor modifications and clarifications were made on a handout also included in their folder (but not specifically covered in class) to allow better recall later.

2.4 Pilot class

At the request of the department of nursing staff development to meet the needs of a class of ICU travel nurses, an extra New User CRRT course was added unexpectedly at the last minute (July 21, 2022) which presented a unique opportunity to test content prior to the go-live date (August 4, 2022). Because most of the course redesign was already done, a version of the pre- and post-assessment tests were completed early and utilized during this class. Sadly, due to a scheduling mishap only three learners were able to attend this pilot class, but some interesting discoveries were made, nonetheless. The most salient of them was that the new content may have served to lower scores post-assessment concerning the calculation of UF, which presented a major concern. Because of this, further modifications to the PowerPoint and handout were made to clarify the technique and strengthen the purpose of UF calculation. In addition, several talking points were altered to serve this need.

2.5 Evaluation methods

To assess whether the presentation increased abilities to document CRRT in Epic, a pre- and post-assessment test were utilized. In the absence of high-fidelity simulation opportunities, well-designed pre and post tests can be effective tools to evaluate increased competency.[17] The pre-test contained one question asking users to rate their comfort in documenting in this specific context. The remaining nine were content-specific and followed the relative weights as determined by the lesson plan. The post-test consisted of 11 questions with the additional one being a free-text feedback request on the course. The nine content questions on the pre-test were matched so that each one had a similar counterpart on the post-test. For most, language was changed to reduce recall of the specific answer choices or was altered entirely to test the same concept with a different question stem. Tests were anonymous and correct answers on the pre-test were not discussed specifically so that the post-test would be a more accurate measure. Pre and post tests were matched so that statistical analyses could be performed with a unique identifier that students generated form their phone number and day of the month of their birthdate.

3. RESULTS

An N of 15 pre-tests and 15 post-tests were returned from the presentation. Results were evaluated with one-tailed matched t-tests using Microsoft Excel for Mac. Overall scores went from an average of 68.9% (SD = 13.4%) on the pre-test to 91.9% (SD = 9.8%) on the post-test, with $t(14) = -6.00$, $p \leq .001$. In addition, confidence increased on the Likert scale (1 = not at all comfortable and 5 being very comfortable) from the pre-test (M = 2.20, SD = 1.21) to the post-test (M = 3.93, SD = 0.80), $t(14) = -6.50$, $p \leq .001$). Because of the construct (confidence) being measured by this question it was considered interval-like data, although some researchers have suggested non-parametric tests be utilized for this.[18]

Confidence was weakly positively correlated to competency

scores in the pre-test (r = .36, p = .183) but not correlated to post-test (r = -.07, p = .79), although neither correlation met cutoffs for statistical significance. Question 11 (free-text comments requesting feedback and suggestions for course improvement) were N = 8 (53.3% response rate) with 33% being positive only, 13.3% being suggestion only, and 6.7% being mixed. It is tempting to discuss the result that confidence increased on the post-assessment but was not as correlated to actual performance but with the high p-values and relatively low N it is a subject better suited to future efforts over longer time periods and with multiple classes.

4. Discussion

The results of the evaluations create several implications for practice. First and foremost, the UF pulled per hour and in sum for the duration of treatment must be improved to match the provider's order. Based on current chart audits, our institution struggles with this, and these results support that notion. A related implication is that ensuring UF orders are appropriate to patient condition; that is, a hemodynamically unstable patient on high doses of multiple vasopressors should not have an outstanding order for 50-100 milliliters per hour net negative UF. Based on other feedback, other applications to practice are reducing time off therapy (between filter set changes or for diagnostic imaging, for example), as well as better tracking of CRRT machines. Improvements in CRRT documentation towards the desired state would all contribute to bringing these changes.

Future interventions would be to make nurses aware of the educational material that currently exists. While many survey respondents mentioned the CRRT SharePoint (an internal website that contains multiple resource documents), awareness of the content it provides may be beneficial. Even though the nurses taking this new-and-improved new user CRRT course may well disseminate knowledge gained from the interventions to their coworkers, the turnover at academic medical centers is high[19] and thus the half-life of the education would be improved if existing users received timely updates. One area that seems particularly well-suited to target for ongoing education is the annual competencies, which all staff who care for CRRT patients are required to take. Developing abridged documentation content for the sessions was a logical next step and was implemented shortly thereafter because of it.

Barriers encountered and limitations of the project

Without a doubt, the most salient barrier encountered during this project was resistance to change. During the survey process and informal interviews, many nurses verbalized the need for education but simultaneously expressed fear of change. Many nurses lamented the institutional EHR change and even stated they wished they could go back, although when asked why they missed the old EHR they weren't able to pinpoint a reason beyond familiarity. Some of these barriers were side-stepped with this intervention because most of the nurses had either 1) no experience documenting CRRT at all, or 2) no experience documenting CRRT our institution specifically. During the literature review process, a major barrier was the lack of published research surrounding nursing CRRT documentation, and it may be invalid to merely assume that the literature regarding general nursing documentation can be applied in this case. Barriers to developing the new lesson plan included loss of favored content and how to apply the literature to the actual lesson plan. Barriers to implementing the newly developed content were the logistics of delivery and scheduling new students. Lastly, barriers to effective evaluation were the lack of validated tools to assess CRRT documentation performance.

There are several notable limitations to this project that must be mentioned. This intervention measured competence of new users to CRRT, not actual performance. The use of only one session for the statistical analyses made for poor correlation and may have been improved over multiple classes. Auditing of charts in care areas that receive these newly trained nurses might elucidate whether the changes in course content has translated to real-world improvements in performance (and ultimately patient outcomes). This presents an exciting opportunity for a future quality improvement project. Another limitation touched upon earlier is that this intervention only affected new nurses, not the practicing nurses that produced the data for the gap assessment survey. Those nurses outnumber the new nurses by many times, so education based on this project must continue to be developed and delivered to nurses who are off orientation.

5. Conclusion

When an academic medical center changed their EHR, the CRRT documentation was completely revamped, and many opportunities existed for improving charting in the new system. The survey performed revealed a perceived lack of education surrounding CRRT documentation. Reviewing the literature found several effective strategies for improving the delivery of documentation education. The existing curriculum was modified to include a new lesson plan that emphasized the importance and operation of charting for CRRT, specifically as it applied to pulling UF. The intervention was evaluated and found to be effective in improving competence. Despite its limitations, this project has created implications for further quality improvement and educational activities.

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CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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