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Scholarly Report submitted in partial fulfillment of the MD Degree at Harvard Medical School

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Student Name: Amy O'Brien

Scholarly Report Title: ICU Rounds Redesign

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Abstract

ICU Rounds Redesign

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Purpose: Multidisciplinary daily rounds (MDR) are an essential part of the development of a culture of team cohesion and interdisciplinary communication in the intensive care unit (ICU). MDR are known to play an important role in patient safety and staff satisfaction, yet rounds vary widely. We aimed to understand the process of rounds in BIDMC's ICUs and to optimize rounds through a frontline provider driven intervention.

Methods: Baseline data was collected through the use of a fishbone diagram and an 18-question staff survey to understand opinions about rounds. Additionally, 120 observations of patient rounds in BIDMC's 7 diverse ICUs were performed. A group of 30-40 multidisciplinary frontline providers then utilized Lean principles to design interventions that were implemented and modified using rapid experiments. A final three-part intervention was selected and dispersed to all ICUs. An 18-question survey was re-administered and 295 post intervention observations of patient rounds were performed.

Results: Results revealed important changes in staff inclusion and communication. Observational data showed that after implementation of our three-part intervention the rate of nurses present for the entire rounds on their patient increased from 66% to 83% ($p < 0.0001$). Frequency of communication about the order of rounds rose from 64% to 100% ($p < 0.0001$). Nurse participation during patient presentation rose from 40% to 87% ($p < 0.0001$), with 87% of those contributions containing new/different information. Nurse participation during the formation of the plan of care rose from 33% to 88% ($p < 0.0001$). Survey data showed the proportion of providers who felt a plan was always clearly communicated rose from 18% to 29% ($p < 0.01$) with 88% of providers feeling that a clear plan was always or frequently communicated to the entire team.

Conclusions: A simple intervention can lead to cultural change spurring more inclusion of all providers, leading to improved interdisciplinary communication across diverse ICU environments.

Contribution

Project Design

I was involved in all stages of project design except design of the initial survey and design of the initial rounds observation tool, as this occurred during the end of my third year of medical school. From that point on I, with my mentor Michael Cocchi, planned and directed the development of all interventions associated with the project.

Project Execution

I was involved in all stages of project execution except for the initial collection of survey data and the 120 baseline observations, which began during the end of my third year of medical school. I participated in, facilitated and directed all stages of intervention development, adaptation, implementation and extensive ongoing and post intervention data collection and analysis. I was a member of a 4-member team that observed 295 patient rounds. I performed ongoing data analysis and presented it to frontline providers each week during rapid experiments to facilitate ongoing revision and implementation of new interventions. I was in the ICUs daily from August 2014-May 2015 helping to facilitate implementation of the intervention once finalized and to continue to receive ongoing feedback.

Project Data Analysis

I performed all data analysis for the project. Tenzin Dechen of BIDMC performed statistical analysis.

Writing

I wrote all of the manuscript below, which was edited by my mentor Michael Cocchi MD and co-author Jennifer Stevens MD, MS. The project will also be presented this year at the Society for Critical Care Medicine's annual conference.

ICU Rounds Redesign Manuscript (preparing for submission for publication)

INTRODUCTION

Daily rounds are a critical part of the development of a culture of team cohesion and fluid interdisciplinary communication in the intensive care unit (ICU). Multidisciplinary rounds (MDR) represent a mechanism by which providers from different professions and specialties can meet to synthesize data, think collectively, and form thoughtful, complete patient care plans. There is evidence that multidisciplinary care in the ICU is associated with decreased patient mortality and that MDR decrease length of stay (LOS) and cost of care without affecting rates of readmission [1-3]. MDR also significantly improve adherence to core quality measures and evidence based care, optimize resident education and improve relationships between providers [4]. These improved relationships between care providers may be important for patients as increased inclusion of non-physician providers and encouragement of open communication between all providers during decision making processes on rounds is associated with decreased adverse event rates [5]. The literature has also demonstrated that structured interdisciplinary rounds, which create mandatory stopping points for nursing input, are associated with early recognition of patients at risk for adverse events, as well as improved communication, higher ratings of teamwork culture, and possibly increased nurse retention [6-9]. Though maximizing interdisciplinary collaboration during rounds is clearly beneficial, the culture of rounds may vary widely between hospitals, between ICUs in the same hospital, and even between providers in the same ICU. Standardizing the rounding process may help to limit the variability during this time of communication, handoffs and decision-making. Success in standardizing rounds has previously been demonstrated by a PICU team at a major academic center through the lean-inspired development of a structured approach using multidisciplinary daily goals sheet that included a role and script for each provider (MD, RN, RT, social work, etc.) Through restructuring rounds and creating clear roles and responsibilities for each participating provider, the team was able to create a more inclusive team dynamic and ultimately demonstrate decreased time spent rounding on each patient as well as decreased healthcare associated infections, LOS and mortality [10]. In targeting optimization of MDR for investigation and intervention we hoped to improve communication and teamwork among ICU providers.

METHODS

Research Setting

The Beth Israel Deaconess Medical Center is an urban, tertiary care academic medical center with 7 unique ICUs and 77 critical care beds. Each ICU operates independently under a different rounding structure and local culture, which includes trainees (residents and fellows), and attending critical care physicians. Additionally there is one cardiovascular ICU for postoperative cardiac and vascular surgery patients staffed by attending physicians and mid-level provider teams. All units are governed under a Critical Care Executive Committee consisting of local leadership from within each unit.

Lean principles

The method in which we developed our intervention is based on the utilization of Lean thinking in the healthcare setting, reviewed elsewhere[11-13].

Identifying the problem

In accordance with Lean principles, we first sought to understand the barriers to an optimal rounding process through engaging the ICU frontline staff. As an initial data gathering step, a fishbone diagram was displayed daily in each ICU for one month. The diagram was entitled “Barriers to efficient rounds promoting optimal patient care, staff communication and satisfaction.” Within the diagram there were 5 categories: methods (procedures, policies etc.), manpower (staff, skills, roles etc.), machines (equipment, instruments etc.), materials (supplies, paperwork etc.) and environment (facility, culture etc.). Over the course of the month, the frontline staff were asked to contribute to the fishbone diagram with specific concerns or examples of issues leading to suboptimal rounds in their ICU. These results were collected daily, collated and analyzed for recurring themes and topics. Themes and topics recurring 3 or more times within these data were targeted for inclusion in a subsequent staff survey. Based on the results of this initial free text data, an 18-question survey (Appendix 1) was designed to further elucidate themes. The survey included demographic questions to identify in which ICU the respondent worked and in what role. The remaining survey questions investigated themes around presence on rounds, barriers to being present on rounds, inclusion of non-MD providers, inclusion of patients and families, interruptions, noise level, protection of patient privacy and development and communication of the plan of care. Possible responses for each question included: never, rarely, occasionally, frequently, always or strongly disagree, disagree, neither agree nor disagree, agree, strongly agree. The final question

elicited free text input. Based on the results of this survey a tool was designed to allow for objective data collection through direct observations of the rounding process in each ICU. The basic structure of rounds in each ICU was mapped and then trained nurse observers conducted 120 direct observations of rounds across the seven ICUs. Data focusing on presence, inclusion and involvement of providers in the presentation, examination and plan formulation were collected. Further data on inclusion of patients and families, introduction of the team to patients and families, and protection of patient privacy were also collected. Data was then informally analyzed for trends and themes for presentation to a large group of frontline staff who would then be involved in developing and driving interventions in their homes units to address identified problems.

Designing solutions

A group of approximately 30 frontline ICU staff consisting of physicians, registered nurses, respiratory therapists, pharmacists, and physical therapists was convened for a half-day session. The group was presented with the data from the fishbone diagram, survey and direct observations. The larger group then split into four smaller groups of 7-9 in order to further explore root causes of suboptimal rounds in one of four themed groups: organization of rounds (ordering, minimizing distractions, and meeting standards of care), presence and contribution on rounds, the plan of care (communication, understanding and coordination), and preserving patient dignity (privacy, respect and communication). Within each themed group, between seven and nine individual contributing root causes had been identified by the survey and direct observations. Each group plotted each root cause within their theme on an impact difficulty matrix. . From this, each group identified one high impact, low difficulty root cause to target for intervention (Figure 1 and 2). After identifying the specific problem, each group specifically stated the impact of the problem, designed an intervention, and then predicted the potential results of the intervention with the aid of a BIDMC based business team trained in the use of Lean principles in healthcare.

Rapid experiments

The intervention for each group was piloted in a single ICU. Real time data tracking the success of its implementation and the effects of that implementation were collected weekly and appropriate modifications and adjustments were made to the intervention based on feedback and data.

Development and implementation of the toolkit

Each group's rapid experiments and fine-tuning of the intervention occurred over 6 weeks at which point a second large group meeting was held with the same stakeholders. Data from the rapid experiments were presented and a finalized toolkit for rollout to all ICUs was developed based on the successes and failures of the rapid experiments.

Data collection

Trained nurse observers performed 286 direct observations of daily rounds using a similar data collection tool with additional metrics identified as important during the rapid experiments.

Statistical analysis

All analyses were conducted using SAS 9.4 (Cary, N.C.) (*Statistical Analysis System (Version 9.4)*, 2013). We conducted bivariate analyses, including chi-square tests of independence, to compare characteristics between pre and post intervention groups.

RESULTS

Fishbone Diagram

A fishbone diagram was posted in all units for one month in order to elucidate barriers to optimal interdisciplinary rounds from the point of view of frontline providers. Open-ended responses identified issues in 6 main categories: communication, respect for other team members, patient privacy, lack of a structured process, conflicting priorities and issues native to the ICU environment. Respondents identified breakdowns in communication as a major issue and noted that missed information happened during interdisciplinary handoffs and that not everyone was aware of the plan of care or of their role in that plan of care. Respondents also felt that the RN was not always notified that rounds was beginning on his or her patient, that RN input was not consistently sought and that interruptions were frequent. Some respondents raised concerns that a crowded and loud environment created opportunities for patients and families to overhear information about other patients. Many respondents felt that the lack of a structured process interfered with optimal rounding and noted again that RN input was not sought, and that each MD team conducted rounds differently. Some respondents felt that the timing of rounds was suboptimal for RNs, who often concurrently needed to provide direct care to patients in a time sensitive manner. Finally respondents felt that the ICU environment was noisy and crowded which led to suboptimal rounds.

These themes were used to inform the creation of a survey and a rounds observation tool to further elucidate barriers to optimal interdisciplinary rounds.

Meeting

A large interdisciplinary meeting of 30-40 attending intensivists, fellows, residents, RNs, RTs, PCAs and pharmacists was convened to review data detailing the successes and failures of the current rounding process in order to plan a more effective process. Problems identified by the survey and 120 direct observations of rounds fell into four general categories: organization of rounds, presence and contribution on rounds, and development and communication of the plan of care. After review of data providers were divided into 3 groups, each reviewing a themed category of barriers to optimal rounds. The groups then utilized impact difficulty matrices to plot each problem and then select one high impact low difficulty problem for which they then designed an intervention for pilot testing in 1-2 units before determination of the final intervention for rollout to all 7 units. During intervention development the groups utilized lean inspired methods, therefore they identified a high impact target, brainstormed the impact of the imperfect process, designed a preliminary intervention that would then undergo PDSA cycles for modification, and then predicted the outcome should this process issue be solved.

Group 1 addressed issues around the organization of rounds. Ultimately the inconsistent communication about the order of rounds was targeted for intervention. The group identified that an unclear order of rounds meant uncertainty about when each patient would be presented and when providers should be available to participate. They believed that this led to decreased RN presence as well as missed communication about orders and the plan of care. Their plan for improvement involved the overnight resident drafting an order for rounds on the board before existing pre-rounds huddle. The order was to incorporate input from nursing and was to take into account patient acuity and new patients. The expected results of this intervention were that all providers would be consistently aware of patient order and therefore would be more able to be present and that subsequently all providers' time would be respected. During PDSA cycles this intervention was well received, consistently practiced and contributed to increased nursing presence on rounds, so was subsequently included in the final intervention.

Group 2 sought to address problems related to presence and contribution on rounds. Preliminary data showed that RNs were present for the entire rounds on their patients only 66% of the time and contributed during the patient presentation (defined as the presentation of data taking place before

proceeding to examine the patient) only 40% and during the formation of the plan of care (defined as the discussion during rounds occurring after the examination of the patient) only 33% of the time. In baseline observations RNs were the most likely provider to miss rounds. Therefore the specific problem the group sought to address was that RNs were sometimes not present on rounds. They believed that the impact of the problem was an incomplete plan of care, likely increased risk of error, and probable delays in execution plan of care. Their initial experiment was to designate a back up person during rounds for primary nurse of patient who could stand in her absence either performing patient care. The expected results were that the primary nurse would be able to give full attention to rounds and always be in the discussion of the care plan, therefore facilitating better interdisciplinary communication and cooperation and improved, more timely communication. Attempts to implement this plan revealed that staffing and logistics around caring for very ill patients made this plan unlikely to be a practical or feasible was to ensure nursing presence on rounds in the long run. Instead, ongoing data collection from simultaneous PDSA cycles performed in other units by group 3 suggested that increased nursing engagement on rounds could increase presence on rounds. Therefore this intervention was modified and a “hard stop” was introduced which required MDs to formally ask for nursing input and about any nursing questions, concerns or corrections after the presentation of the patient and before the examination of the patient. This was well received by staff, flowed naturally with the existing structure of rounds, and increased nursing participation and presence on rounds in the rapid experiments and was thus included in the final intervention.

Group 3 targeted problems around development and communication of the plan of care. This group was also interested in data showing that nurses were only contributing to the plan of care 33% of the time. They were also concerned by survey data suggesting that only 18% of all providers and 13% of RNs felt that a clear plan of care was communicated by the end of rounds on each patient. They identified lack of a clear plan and lack of a clear time for RN to communicate concerns and thoughts regarding plan of care as issues for intervention. They described that this suboptimal processes likely resulted in missed communications about the plan of care and was making nurses feel like they were not part of the team. Their initial intervention asked nurses to summarize the plan of care at the end of rounds which they expected to increase efficiency (everything communicated at once), create team harmony and help to ensure everyone heard the whole plan. Though nurses appreciated a designated time to voice concerns, many clarified that summarizing felt like a pop quiz to new nurses and felt unnecessary to more experienced nurses. However,

preliminary data showed that there had been an increase in nursing presence and that during 48% of summaries there had been a miscommunication or clarification identified. Therefore the intervention was modified and the resident leading rounds was designated to perform the summary. This was received as helpful, especially for complicated patients with long plans and was therefore included in the final intervention. Furthermore, data from this unit suggesting that introducing formal time for nursing input may increase presence on rounds was used to inform progress in the intervention for group 2.

The finalized, simple intervention

Preliminary data from rapid experiments helped inform three simple interventions that could be applied across all ICUs regardless of specific cultural differences or historical workflow differences between the units:

1. Before rounds, the overnight resident will write a predetermined order of rounds on the patient census white board in a centralized location in each unit. He or she will incorporate RN input, patient acuity, and new patient status into selection of the order.
2. While nursing input is encouraged at any time, there will be a designated hard stop at the end of the patient presentation and before the patient examination, in which the nurse will be asked if she or he has any questions, concerns or information to add.
3. At the conclusion of the plan, the presenting resident will briefly and succinctly summarize the major actionable items for the day.

The impact

How did we measure change?

An 18-question survey was administered pre and post intervention, 1 year apart in the same month, to all physicians, nursing staff, and midlevel providers in the ICUs. There were 236 (26%) respondents in the pre intervention survey and 203 (23%) in the post intervention survey. There were no significant demographic differences with regard to primary unit or profession. We were interested primarily in parameters measuring level of collaboration, communication and respect. We separated our analysis of these data into responses from all providers and responses from RNs only. We also conducted direct observations of behaviors and practices on daily rounds; there were 120 baseline observations of rounds, followed by 292 post intervention observations of rounds, performed by trained nurse observers and a research assistant using a pre-designed data collection tool.

What did we find? Participation, collaboration, communication, respect

Objective Observational Data

After implementation of our three-part intervention, we found that the frequency of nurses being present for the entire episode of rounds on their patient increased from 66% to 83% (see Figure 3). Additionally RN presence for at least part of rounds rose from 89% to 96%. The frequency of communication about the order of rounds communicated before beginning rounds rose from 64% to 100%. Nurse participation during patient presentation rose from 40% to 87%, with 87% of those contributions containing information that was new or different from what had been already been presented by a resident or midlevel provider. Nurse participation during the formulation of the plan of care rose from 33% to 88%, also with 87% of those contributions containing new or different information. MDs performed summaries of the patient plan of care in 88% of observations.

Subjective Survey Data

Observations were supported by survey data in which the proportion of RNs answering “I am always present for rounds on my patient” rose from 28% to 41% (See Figure 4). In additional survey data the proportion of providers answering always or frequently to the statement “I am notified of the order of rounds before rounds begin” increased from 56% to 77% in all providers and from 42% to 69% for RNs. Furthermore, the proportion of providers answering always to the statement “I am notified when rounds begins on my patients” rose from 38% to 51% for all providers and from 14% to 31 % for RNs, with 86% of RN’s responding always or frequently. When participating, 99% of all providers and 98% of RNs felt that their input during rounds was respectfully considered post intervention compared to 96% and 91% respectively pre intervention. Additionally there was an increase in the proportion of providers who felt that the plan of care was always or frequently clearly developed during rounds (from 88% to 92% for all providers and 82% to 92% for RNs). Finally more providers felt there was a clear plan of care communicated to the entire team at the end of rounds post intervention. The proportion of all providers who felt a plan was always clearly communicated rose from 18% to 29% and the proportion of RNs rose from 13% to 25% with 88% of providers feeling that a clear plan was always or frequently communicated to the entire team.

DISCUSSION

The benefits of cohesive multidisciplinary care in the ICU extend to patients and staff alike. For patients, multidisciplinary care and associated improved communication portends decreased mortality and length of stay [3]. For providers multidisciplinary rounds optimize resident education and improve relationships between providers [4]. As communication breakdown is one of the primary sources of medical error identified by the Joint Commission, measures to increase effective interdisciplinary communication are of the utmost importance [14].

Our study has demonstrated that the implementation of a simple structure that can be overlaid on existing workflow and rounding culture in several different types of ICUs can result in improvements in engagement of nursing staff, and improvements in communication.

Our approach to this project was unique in that we intentionally asked frontline providers to identify inefficiencies and barriers to optimal team functioning and then engaged them to be the designers and executors of experimental solutions. The goal was to empower teams to shift toward more inclusive, collaborative interdisciplinary rounds and more effective communication with the ultimate goal of safer patient care.

Our three item toolkit resulted in a significant increase in the number of RNs present for the entire rounds on their patients, an increase in communication of the order of rounds, and an increase in RN participation during the patient presentation and plan, with 87% of that information being new or different. We also demonstrated that these observed changes affected provider responses to the survey tool, particularly nurses, with significantly more RNs reporting inclusiveness demonstrated by being notified rounds were beginning on their patients, significantly more RNs reporting that they felt they were always present for the entire rounds on their patients, and significantly more nurses reporting that a clear plan of care was developed and communicated during rounds. Similar trends were noted in non-nursing providers who responded to the survey.

The literature supports improving communication, collaboration and teamwork as critical components of providing safer care to patients in the ICU setting. It has been estimated that there are approximately 148,000 serious or life-threatening errors in critical care settings each year [15] with 1.5-2 serious errors with the potential to cause harm occurring per day in direct observations of a typical ICU [15, 16]. Suboptimal interdisciplinary communication is a leading cause of preventable harm and serious conflict in ICUs [17-19]. In fact, communication was deemed a root cause for two thirds of sentinel events reported to the Joint Commission between 1995-2005 [14]. Given that the nurse is often the frontline provider with the most up to date and nuanced information about an ICU patient, many were surprised by our pre-intervention findings that RNs

were contributing to rounds only 30-40% of the time and that nurses were present for the entire rounds on their patients only 66% of the time. However, this type of lack of team integration and lack of effective interdisciplinary communication is well documented in the literature. Members of each profession in the ICU are trained in discrete and disparate methods of communication that emphasize different content or may have a unique focus [20], creating serious obstacles for effective interdisciplinary communication. Studies have particularly emphasized ineffective communication between nurses and doctors as a source of error [16]. For instance, direct observations of one ICU team showed that, though verbal exchanges between doctors and nurses constituted only 2% of observed activities, they were considered contributory to 37% of recorded errors [16]. Furthermore, studies at John's Hopkins University analyzing adverse event/ critical incident data identified that failures of communication were largely attributable to lack of communication between doctors and nurses, inaccurate transfer of information between teams, reluctance of the nursing staff to report observed errors, and poor communication of information about newly admitted patients [21-24]. These themes were echoed by our rapid experiments, which clearly demonstrated that MD to RN miscommunication was common with nearly 50% of end of rounds summaries identifying a miscommunication or clarification.

Clearly, effective interdisciplinary communication is critical to the delivery of safe, high quality care in the ICU [5, 24-28]. The question then becomes how to build systems to support this communication and facilitate culture shift to a more open system. Beginning to deconstruct the existing culture first requires understanding of the sources of barriers. Due to the physician driven culture of most ICUs and the hierarchical construction of ICU teams, nurses report that it is difficult to speak up. Furthermore when they do speak up, nurses are more likely than doctors to feel that disagreements are not appropriately resolved, that more input into decision-making is needed, and that nurse input is not well received [29]. When surveyed, nurses report lower levels of communication openness than doctors [25], further demonstrating a hierarchical culture that prioritizes the voice of physicians. It is critically important that we further understand and begin to deconstruct this paradigm to facilitate interdisciplinary communication as collaborative decision making has been linked to improved patient and staff outcomes [30]. Providing a hard stop for nursing input, as in our intervention, seems to create dedicated space for consistent nursing input that minimizes hierarchy, encourages communication, and prioritizes information and patient care. This may be because providing a hard stop defines nursing input as an expectation rather than an option. Providing a dedicated time for expected input minimizes barriers preventing nurses from speaking up. This concept finds support in the literature where, in a study conducted by a large

healthcare center, the preoperative huddle was transitioned from an unstructured commentary from the head surgeon to a multidisciplinary scripted huddle with mandated input and time to voice concerns for the anesthesia team, the nurse circulator and the scrub nurse. This transition led to a 16% decrease in nursing turnover, a 19% increase in employee satisfaction, and a transition of perceptions of operating room safety climate from good to outstanding [31]. This transition to more open communication is critical as prompt, accurate, open communication between physicians and nurses has been associated with shorter length of stay and lower staff turnover[26]. Furthermore, units with higher levels of collaboration between nurses and physicians during patient-transfer decisions have lower rates of risk-adjusted mortalities and higher levels of nurse and resident job satisfaction[30]. As demonstrated in our study implementing protocols to support communication across hierarchical barriers, one can create a system where all staff are expected and encouraged to give voice to their opinions and concerns, maximizing human capital for patient safety.

Limitations

It is important to note the limitations of our study. First, the response rates for the surveys were 26% and 23%, for the pre intervention and post intervention surveys respectively, raising the possibility of bias among those staff members who responded. Secondly, while the rounds observation data were collected by trained observers, it is possible that ICU teams modified their behaviors if they were aware that they were being observed about rounding procedures. It is worth noting that staff perceptions of changes seemed to track with the direct observations, suggesting that behaviors were impacted by the tool kit. Finally, while our data suggest improved communication between the care team, we did not attempt to correlate that with incidence of complications, or any change in morbidity or mortality, or any other traditional measure of harm. Lastly, while we did use this tool kit across 7 distinct ICUs with unique ‘cultures,’ these data reflect a single institution, and therefore generalizability may be limited. .

Conclusions

In conclusion, we have demonstrated that it is possible to achieve improvements in communication and staff engagement during daily rounds in seven heterogeneous ICUs using a tool kit consisting of three simple interventions. By mandating a degree of standardization and participation during rounds, we set expectations for inclusion and interdisciplinary closed-loop communication. Though this is initially scripted into rounds, over time this approach to rounding results in new generations of trainees and new staff adopting these expectations as culture, moving ICU teams toward

teamwork that promotes patient safety. Further study is warranted to determine whether this type of tool kit can impact patient harms.

Figure 1: Overview of Intervention Development

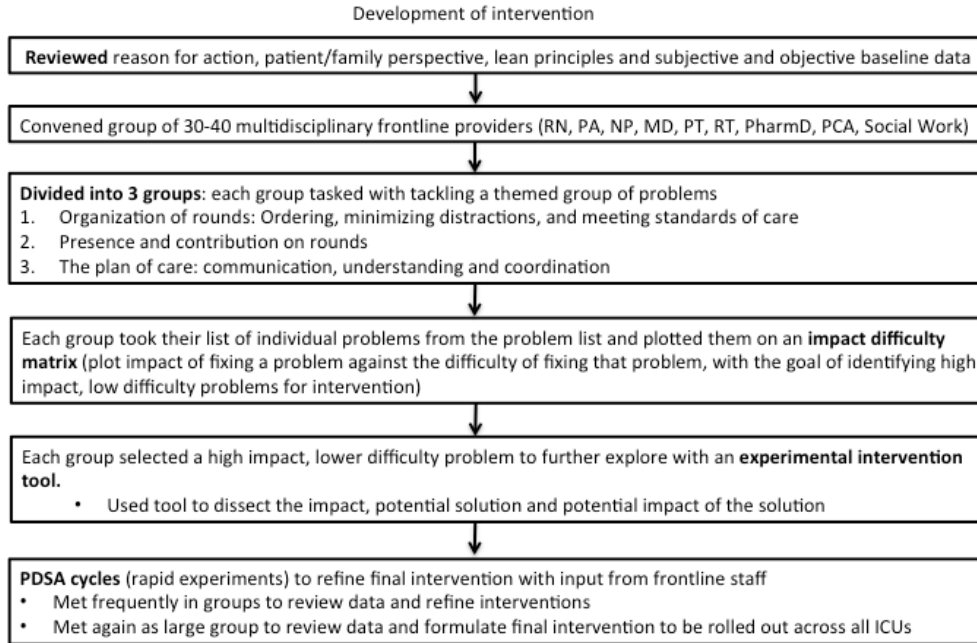


Figure 1: Outline of the phases of development of our intervention. Methods inspired by Lean principles.

Figure 2: Overview of Data Sources

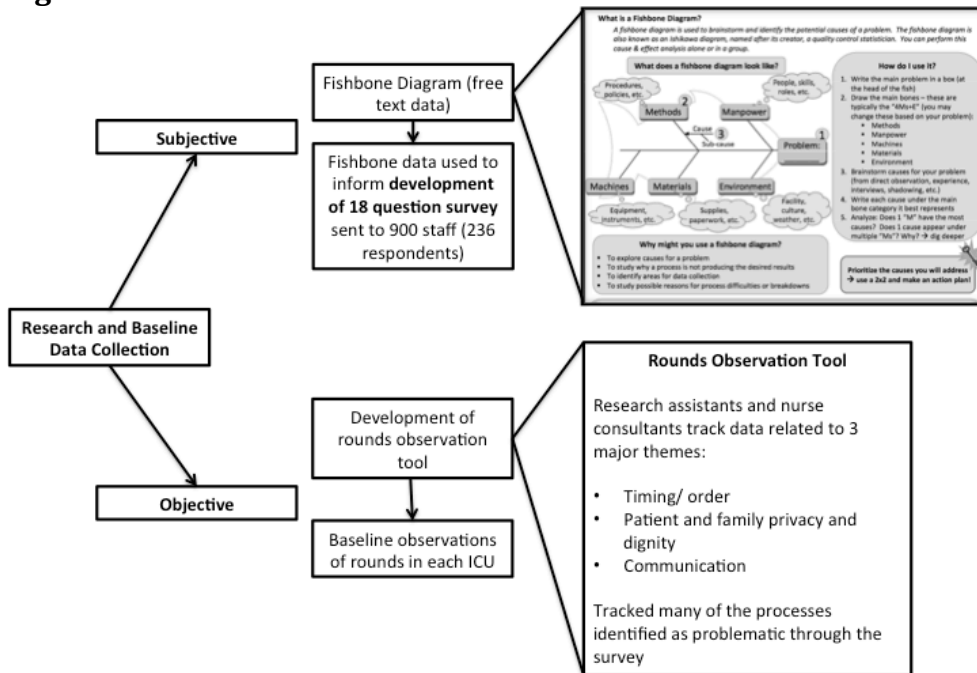


Figure 2: Sources of data informing development of intervention.

Figure 3: Pre and post intervention results of direct rounds observations

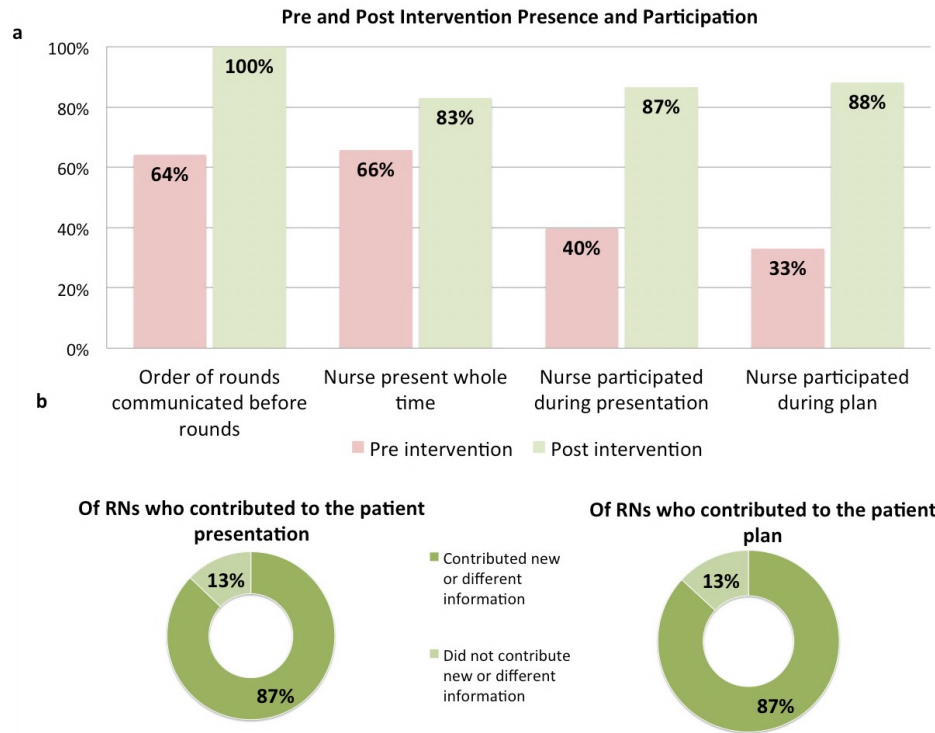


Figure a: Objective Observational results. Pre intervention N=120 individual observations of patient rounds and post intervention N=292. *p<0.0001, **p=0.0001. Figure b: Post intervention analysis of content of RN contributions. N=228 and N=202 respectively.

Figure 4: Pre and post intervention results of staff survey

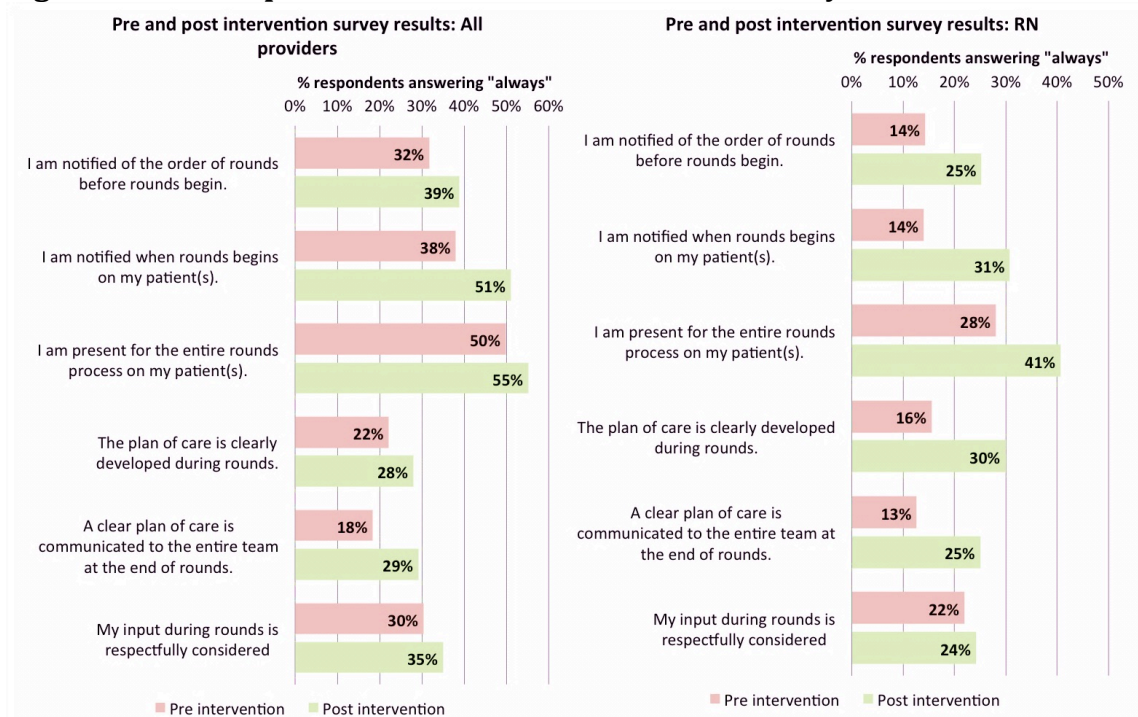


Figure a: Analysis of survey data from all responding providers pre and post intervention. Pre-intervention N=236 and post intervention N=203. Figure b: Analysis of survey data from all responding providers who identified themselves as RNs. Pre-intervention N=107, post intervention N=91. *p<0.05. **p=0.05

Appendix 1: 18-question staff survey

ICU Staff Survey Questions
Q1: What is your primary work area? If you are a physician, please choose the unit in which you most recently participated in rounds.
Q2: What is your role in the ICU?
Q3: I am present for the entire rounds process on my patient(s).
Q4: I am notified of the order of rounds (which patient will be presented 1st, 2nd, 3rd, etc.) before rounds begin.
Q5: I am notified when rounds begins on my patient(s).
Q6: When the patient or nurse is unavailable due to a procedure or travel off the unit, the order of rounds is adjusted.
Q7: My input during rounds is respectfully considered.
Q8: Interruptions are barriers to effective rounds.
Q9: Noise level is a barrier to effective rounds.
Q10: When available, the patient and / or family is invited to join multidisciplinary rounds.
Q11: The team makes an effort to protect patients' sensitive health information during rounds.
Q12: Question 12 applies to SICU / TSICU only: Input from the primary team is available at the time of rounds.
Q13: Input from consulting services is available at the time of rounds.
Q14: The plan of care is clearly developed during rounds.
Q15: A clear plan of care is communicated to the entire team at the end of rounds.
Q16: Once developed, a clear plan of care is communicated to the patient or family.
Q17: Long-term goals for patients (such as case management involvement, plans for rehab, CMO status, etc.) are addressed on rounds.
Q18: Please feel free to offer any further thoughts about the state of multidisciplinary rounds on your unit, or suggestions for its improvement.

Appendix 1: Questions from 18 question survey administered to staff pre and post intervention.

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