PROVIDER PERCEPTIONS OF ROUNDING CHECKLISTS IN UPMC INTENSIVE CARE UNITS

by

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ABSTRACT

Rounding checklists are increasingly common intensive care unit (ICU) quality improvement tools designed to standardize care, facilitate delivery of evidence-based practice, and prevent errors of omission. Despite their strong conceptual rationale, studies of ICU rounding checklists have shown conflicting results. We sought to understand critical care providers' perceptions of the purpose and value of checklists; as well as barriers and facilitators to effective utilization of checklists during daily rounds. We performed a mixed-methods qualitative study in 32 ICUs within 14 hospitals within the UPMC health care system. Data collection included direct observation of daily rounds and semi-structured interviews which were thematically coded for a priori determined themes and emergent content using NVivo software. We conducted 89 interviews and performed 114 hours of observation. Among study ICUs, 12 (37.5%) used checklists and 20 (62.5%) did not. When present, ICU rounding checklists were not widely adopted and use was inconsistent. Standardization of care and improved communication through the initiation of interprofessional conversation regarding daily goals of care were described by participants as the purpose of rounding checklists. Checklists were perceived as helpful when they were relevant to that particular unit's patient population and were perceived as unhelpful when viewed as "cookie-cutter medicine," restricting clinicians' ability to customize care. Some participants remarked that the

word "checklist" itself has negative connotations related to over-standardization, affecting consistent use, instead proposing more neutral language such as "rounding tool." Respondents identified several practical barriers to use, including time to complete the checklist, lack of follow-up on checklist use, and resistance to use by one or more rounding team members. We present a framework for effective implementation by creating checklists which: are relevant to the particular unit, ensuring that checklist use is unit-specific rather than provider specific, and emphasizing the importance of achieving buy-in across stakeholders. Our results provide insights about why checklists frequently fail to improve outcomes and offer a framework for effective checklist implementation through more feedback and accountability. Successful implementation of checklists could have far-reaching public health impact due to their potential to reduce costs and loss of life associated with communication and omission errors.

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1.1 Overview

Increasing evidence of the gap between clinical evidence and clinical practice have brought efforts to implement evidence-based practice to the forefront of modern medicine[1]. This is true not only broadly but also in the intensive care unit (ICU), where providers struggle to consistently implement evidence-based practice at the bedside [2]. One approach to address this problem is through the use of rounding checklists. Rounding checklist can be defined as a tool used to remind clinicians to address specific topics related to health care quality or efficiency while on daily rounds. In industries like manufacturing and aviation, checklists have proven to be useful tools to increase safety and prevent errors [3]. Similarly, in the ICU checklists might provide a framework for consistent delivery of evidence-based practice by prompting key discussions among the interprofessional care team.

Despite this strong conceptual rationale, the evidence demonstrating that checklists actually improve patient outcomes is inconsistent. Data from one study found that the presence of a checklist did not have a significant effect on process of care outcomes, however, there was a significant increase in ventilator-free days, a significant decrease in empirical antibiotic use and central venous catheter duration, and increased rates of prophylaxis for deep vein thrombosis and stress ulcers when physicians were prompted to address items on the checklist[4]. Some data suggest that using a checklist improves the use of evidence-based practice and aids in error avoidance[5-7]. However, other studies show persistent serious evidence gaps despite the use of rounding checklists[4] and no association between the introduction of a rounding checklist and in-hospital mortality[8]. To understand why checklists have not consistently improved patient

outcomes, we conducted a qualitative study to understand ICU providers' knowledge, attitudes, and beliefs regarding their use. Our overall goal was to understand how ICU providers perceive rounding checklists and develop a framework for more effective rounding checklist implementation.

1.2 History and Rationale for Quality Improvement in Healthcare

Quality Improvement has a long history in the field of medicine, the seminal advancement being the incorporation of routine handwashing during medical care in the 19th Century. While there have been numerous additional advancements within quality improvement, the current Quality Improvement Movement stemmed from academic articles stressing the discrepancy between available resources and quality of care delivered[9]. In 1966, Dr. Avedis Donabedian developed a model for assessing quality of healthcare. The Institutes of Medicine(IOM) were later established as a platform for the measurement of quality of healthcare as well as for information sharing[9]. The Agency for Health Care Policy and Research was founded in 1989 with the goal of standardizing practice guidelines and examining clinical effectiveness and treatment outcomes. Lastly, the National Committee for Quality Assurance was established in 1990; its aim was also to improve quality of health care[9].

Various methods were established on multiple levels to understand the current climate of health care quality and where improvements could be made. One of the tools that has been introduced to Quality Improvement is the checklist. A checklist is defined as, "..a list of action items or criteria arranged in a systematic manner, allowing the user to record the presence/absence of the individual items listed to ensure that all are considered or complete."[10] Various approaches have been applied to aspects of care to ensure quality and standardization of care, however, the main rationale for QI tools is to reduce error and improve best practice adherence.

Because rounds are an essential time for clinicians to discuss patients' courses of care as well as evidence-based practice, a rounding checklist would seem to be a beneficial tool to incorporate into rounds. Due to the complexity of patients and numerous evidence based practices, a checklist could assist clinicians in considering evidence-based practices for patients as well as helping to standardize care across patients as well as clinicians by acting as a reminder.

1.3 Checklists and Quality Improvement from Other Industries

Many other industries have adopted checklists in order to reduce error in high-risk situations. Examples of industries that have adopted checklists include: aviation, product manufacturing, and construction. Industries that have incorporated checklists into their functionality have an understanding that human error, although often preventable, is common and can cause a danger to the public, potential loss of life, increased cost, or a combination of the aforementioned.

1.3.1. Aviation

Aviation is one of the more common examples of checklists used in an industry to reduce error which could be catastrophic. Even the most experienced of pilots use checklists at different stages in flight, particularly before take-off and during landing. Over the years, aviation has produced additional checklists for different situations from a pilot's mental health prior to take off to emergency landing to handling more complex planes[10]. There are several types of checklists in aviation from pre-flight to emergency situations. Professionals in the field specify that checklists must be short, easy to ready, and relevant. When checklists were introduced in aviation, they were placed on an index card. Since then, many more checklists have been developed and some airlines have incorporated checklists into the cockpit computer while others maintain paper checklists. One of the main reasons that checklists are effective in aviation is that pilots understand that mistakes

may occur when relying on memory alone, and pilots are trained to put trust in checklists to avoid such errors[3]. In aviation, checklists are not a tool used as a reminder, but they are often a mandatory aspect of the job that must be completed before leaving the ground in order to ensure the safety of the pilots, crew, and others. In one famous instance among countless others, a pilot named Captain Chesley B. Sullenberger III conducted an emergency landing of a plane containing 155 persons on the Hudson river. With help from his crew, Sullenberger followed emergency aviation checklists to safely land the plane without any loss of life. Given the numerous examples of aviation checklists being used to avoid catastrophe, it is not possible to truly estimate the number of lives saved by aviation checklists.

1.3.2 Manufacturing

Manufacturing is another sector that encourages standardization of processes: to save money. Checklists are commonly used in product manufacturing to ensure that an error does not increase the cost of production; checklists are seen as a tool to protect the company's bottom line. Additionally, checklists in product manufacturing for goods such as cars and food serve as a requirement to avoid safety risks for consumers. Checklists that provide quality assurance are typically handed down from governing bodies to guarantee regulations are followed[10]. Through a system of checks and balances, regulations, such as those from the Food and Drug Administration, help to reduce the risk of wide-scale harm by preventing the introduction of flawed products to the consumer market.

1.3.3 Construction

As Atul Gawande discusses in his book, *The Checklist Manifesto-How to Get Things Right,* construction projects, which often take months, sometimes years to complete, are broken down into numerous checklists, ensuring that the large complex structure is not hindered by a small mistake. Because of the immense number of responsibilities delegated to various individuals in current-day construction feats, many construction companies rely on a series of checklists to be sure that buildings come together in a timely, safe manner. With the help of computer programs, contractors, electricians, laborers, engineers, carpenters, and others involved in the building process are able to communicate when something on the checklist is not quite right or if a question arises[3]. Despite the fact that we build about 70, 000 new commercial buildings and a million new homes each year in the US, there are only about twenty serious "building failures" each year[3]. This points to the process of building and the ability to catch potential errors along the way so that they do not result in full building failure.

Stressful working conditions have been found to increase the likelihood of human error[11]. The level of stress experienced by clinicians can contribute to error in the medical field. In the report, To Err is Human, the Institute of Medicine estimates that medical error accounts for 44,000 to 98,000 deaths annually in the United States[12]. Despite this statistic, the medical community has been slow to adopt the concept of checklists for day-to-day use.

1.4 Checklist Use in Critical Care Medicine

Peter Pronovost introduced a checklist at Johns Hopkins University Medical Center in 2001 in an effort to decrease central line acquired blood stream infections. Pronovost created the checklist

by writing out steps involved in central line placement that were crucial to avoiding infection. Once the list was created, teams at Johns Hopkins were asked to utilize it each time a central line was placed. After implementation, central line infection rate at Johns Hopkins reduced from 11% to 0%[13]. Since Pronovost's introduction of checklists, many others have attempted to incorporate medical checklists into care, such as Atul Gawande with his surgical checklist which was backed by WHO to reduce surgical complications worldwide[3]. In a before-after study across 8 different hospitals whose purpose was to pilot the WHO Surgical Safety Checklist, overall death rate was significantly reduced from 1.5% before checklist implementation to 0.8% after checklist implementation and overall complications were significantly reduced in 11% of patients before checklist implementation to 7% after the introduction of checklists[14].

As medicine becomes increasingly complex, physicians and other medical personnel are investigating the use of rounding tools as an option to decrease human error while maintaining timely rounds and increasing positive patient outcomes. A rounding checklist can be defined as a tool used to remind clinicians to address specific topics on rounds related to health care quality or efficiency. Rounding checklists are also commonly referred to as rounding tools or daily goals checklists.

In current studies, researchers typically combine daily checklists with education and reminders or prompting for checklist use. Education focuses on informing rounding team members on the uses of checklists. Reminders or prompting are used to ensure that the checklist is used during rounds. Items included on checklists are based on a combination of daily goals, processes of care, and evidence-based practices. Primary goals for the studies involved: understanding ICU clinicians' perspectives and attitudes regarding rounding checklists, measuring physician compliance, and measuring outcomes associated with rounding checklist utilization[5-8, 15, 16].

A study by Centofanti et al. investigated the use and perception of a daily goals checklist for rounds in a fifteen bed closed ICU for medical-surgical patients. This mixed-methods study found that the predominant users of the checklist were residents, who found that it could also be used as a teaching-tool. In addition, researchers found that the clinicians overall found the tool to facilitate structured, improved interdisciplinary communication while allowing an individual approach to patient care. In this study, the checklist was completed 93% of the time and predominantly by residents[15].

Other studies focused on physician compliance with daily rounding checklists and items included in care bundles[5, 7]. DuBose et al. proposed using a quality rounding checklist to assist in increasing physician compliance with 16 clinically significant prophylactic measures[5]. Dubose et al. found increased compliance with measures not previously at >95% compliance including head of bed elevation, sedation holiday and peptic ulcer and deep venous thrombosis prophylaxis[5]. Additionally, DuBose et al. noted a decrease in central line duration and infection, ventilator duration, and self-extubation[5]. However, Carlos et al. acknowledged the issue of physician compliance with checklist use. While the checklist is a good tool to remind clinicians of prophylactic and protocol measures, physicians and other members of the rounding team do not always use the checklist for every patient. To combat the issue of physician compliance with the checklist, Carlos et al. recommended the implementation of "Physician compliance reporting" which included a bimonthly publication of physician checklist use via email. In their study, physician compliance with checklist use was improved with compliance reporting[7].

Checklist studies in critical care also focus on the implications of checklist use. Two examples of prospective before-after studies attempted to examine if there is a relationship between checklist compliance and outcome improvement[6, 16]. In one study, a combination of

the checklist, education, and reminders supported a reduction in duration of nonessential central venous catheter use[16]. The checklist was used in combination with physician compliance reporting to ensure high levels of checklist use in the unit; this study found a sustained improvement in Ventilator-Associated Pneumonia bundles[6].

Cavalcanti et al.[8] used a randomized control trial to examine checklist use in critical care medicine. Researchers randomized 118 Brazillian ICUs to checklist use or no checklist use. The results of this study differ from most checklist studies in critical care in that researchers found no significant reduction in the main outcome of interest, in-hospital mortality, with the use of daily checklists, goal setting, and clinician prompting in the experimental group compared to the control group. However, secondary outcomes including low tidal volumes, avoidance of heavy sedation, use of central venous catheters, use of urinary catheters, perception of team work, and perception of patient safety climate were significantly improved in the experimental group[8].

Overall, current literature on checklist use in the ICU is conflicting for several reasons. To start off with, there may be a degree of random error across these studies. Given the variability across patients, medical care providers, and health systems, it is possible that we are unable to see the true effect of checklists in each of these studies. Secondly, a majority of the literature cited here was collected via observational before-after studies. As we know, observational studies are more susceptible to bias and unable to account for all possible confounders. Cavalcanti et al. are the only researchers here to carried out a cluster randomized controlled trial[8], which should be less biased than the other studies examined in this short review. To that point, each study's value should be weighted in accordance to study design. Lastly, checklists have been found to be effective in some settings, such as aviation, manufacturing, and construction as well as certain medical settings, however, they have also been found to be ineffective in other, similar settings.

Perhaps the question is not if a checklist works, but what conditions are optimal for effective checklist use.

1.5 Barriers and Facilitators to Quality Improvement in Healthcare

Although the field of Quality Improvement in medicine is not a new concept, barriers still exist to implement evidence-based practice using Quality Improvement projects and tools. Several types of barriers include: structural, peer group and professional[17]. For example, in a structural type barrier, there may be a need for additional staffing of a unit, however, this is not always achievable. The lack of sufficient staffing to care for patients means that there is even less time for existing staff to devote to Quality Improvement. In peer group type barriers, there may be a standardly accepted diagnostic test in a given area, but it may not be the most up to date evidence-based practice. Professional type barriers include things such as attitudes or beliefs towards guidelines[17]. One or more of these barriers are likely to exist in any given Intensive Care Unit.

1.6 Gaps in Current Knowledge

While the vast majority of medical professionals and current literature suggest that using a checklist has the potential to improve the likelihood of standard care and avoiding error[5-7, 15, 16], other studies have shown no significant association between checklist use and reduction of in-hospital mortality[8]. Research on how best to increase clinician compliance of checklists as well as ways to maintain compliance are essential to reduce errors and adverse events. Understanding individual clinician perceptions of rounding checklists and developing aims focused on clinician and unit-dependent perceptions is one way to potentially increase checklist compliance and associated patient outcomes.

1.7 Public Health Significance

There have been conflicting results concerning the utility of checklists in the arena of critical care medicine. While other fields have improved outcomes and avoided accidents with the application of checklists, the field of critical care appears to be undecided on the proper development and implementation of checklists. Despite the limited data, one report estimated that medical error accounts for 44,000 to 98,000 deaths annually in the United States[12]. A more recent study estimates that medical error accounted for 251, 454 deaths in the year 2013, which would make medical error the third leading cause of death in the United States[18]. In 1999, these errors were estimated to cost the United states between $17 billion to $29 billion annually, an estimate that is surely higher by today's inflation[12]. We have seen checklists applied successfully to other areas of medicine, and expanded checklist implementation could serve to reduce medical errors and associated costs. Further research must be done to better understand clinician perception of checklist use during rounding in critical care.

Understanding health care provider perceptions and utilization of checklists is an important component to ensure the appropriate implementation of well thought out, impactful checklists. More research must be conducted on the provider perception and utilization of checklists. Long term impacts of appropriate checklist implementation could yield victories for public health such as reduced medical errors and associated costs.

2. Objective

This Quality Improvement project conducted in the Clinical Research, Investigation, and Systems Modeling of Acute Illness (CRISMA) Center at the University of Pittsburgh sought to quantify current checklists used by ICUs in UPMC, a multi-hospital integrated delivery system in western Pennsylvania, as well as observe and interview providers to develop a better understanding of the utilization and perceptions, as well as barriers and facilitators, of such lists. This work will conclude with the introduction of suggested guidelines for improved checklist development and implementation at UPMC.

3. Methods

3.1 Study Design

We conducted a qualitative study of ICU checklists using direct observation and semi-structured interviews with care providers within 32 ICUs in 14 hospitals in a large integrated health system located in Southwestern Pennsylvania from April 2016 to August 2016. For the purpose of this project, we defined a rounding checklist as, "a tool used to remind clinicians to address specific topics related to health care quality or efficiency while on daily rounds". Unit directors in all 32 adult Intensive Care Units were contacted via email to determine baseline ICU characteristics including checklist use, the approximate date when the checklist was implemented, the presence of multidisciplinary rounds, the type of care providers who attended these rounds, the presence or absence of trainees on rounds, the number of beds, and the physician staffing model (i.e. open or closed). After collecting baseline information, we obtained copies of available rounding checklists via email correspondence with unit directors and scheduled visits to the ICUs for direct observation.

3.2 Data collection

3.2.1 Direct observations

Direct observations took place during daily morning rounds in participating intensive care units. The purpose of these observations was to observe rounding checklist use in action, as well as observe, in ICUs that not use a formal rounding checklist, how evidence-based practices were addressed on rounds. All observations were performed by a researcher trained in medical ethnography. Observations were started before daily rounds officially started and concluded at the end of daily rounds as indicated by the rounding team members. The research coordinator took

notes by hand during direct observations and transcribed notes to a word document following each visit. We sought to observe interdisciplinary rounds in each participating intensive care unit at least once throughout the study. In cases in which staff informed us that our initial visit day was out of the ordinary we were flexible to perform repeated visits in selected ICUs.

3.2.2 Semi-structured Interviews

Interviews with care providers were performed after rounds in participating ICUs. The purpose of the interviews was to provide deeper insight into the use of checklists as well as to triangulate data from the direct observations. We targeted four types of providers: bedside nurses, physicians, respiratory therapists, and pharmacists. These clinicians were typically present on rounds and were thought to have the most insight into the use of evidence-based practice. The preliminary interview guide was developed using a literature review and the expert opinion of the investigators. We piloted guide on a convenience sample of two physicians, a nurse, and a physician's assistant, making revisions for clarity based on their feedback. Our final semi-structured interview guide (see appendix) contained three major domains: purpose of daily rounds, general checklist knowledge and use, and checklist use in the interviewee's unit. All questions were framed to elicit open-ended responses, and probes were used to provide further clarification when needed and encourage open-ended responses.

The interviews themselves were conducted individually in a private room within each ICU, generally after the completion of rounds. Interviews were conducted on a convenience sample of targeted clinicians that participated on rounds. When rounding team members were not available immediately following rounds for interviews, participants were asked if they would be willing to take part in an interview at a later time or via telephone. Interviews were recorded and transcribed verbatim. Interviewee demographics were collected via a written form at the time of interview.

3.3 Statistical Analyses

ICU characteristics and provider demographics were analyzed using standard summary statistics. Direct observation notes and interview transcripts were uploaded into commercially available qualitative analysis software (NVivo, QSR International, Melbourne, Australia). A codebook was developed to identify and summarize themes. Observations and interviews were thematically coded for a priori determined themes and emergent content using NVivo software. Four trained investigators concurrently coded the data, resolving any differences through iterative discussion and consensus. Qualitative results were reported as overarching themes, themes related to particular interview questions, and barriers and facilitators to checklist use.

This work was primarily designed to improve the quality of care within the UPMC Health System. As such it was reviewed and approved as a quality improvement project by the UPMC Quality Improvement Committee, a body designated to review quality improvement projects under the authority of the University of Pittsburgh Human Research Protection Office.

4. Results

4.1 Observations

Observations allowed the opportunity to see if and how a checklist was utilized in each particular ICU. Interestingly, sometimes the checklist that we received during correspondence with unit directors was different from the checklist in use during observations. The use of checklists varied widely across the different units as well. In some units, the checklist was read off verbally by the attending physician item by item either at the beginning of a patient or the end. Other times, residents or fellows were responsible for completing the checklist. Typically, a trainee would take charge of the checklist while a different trainee presented the patient. The trainee with the checklist would ask clarifying questions at the end of patient presentation to ensure that each item on the list was covered. Differing still, sometimes bedside nurses or charge nurses were tasked with completing the checklist; typically nurses completing the checklist while listening to the discussion rather than raising each point individually, clarifying at the end of each patient presentation when they felt that an item was left out or overlooked. In other units, we were told that there was a checklist, but it was not used during the day of our observations. In total, 17 of the 32 ICUs stated that they had a rounding checklist, however, only 12 units utilized rounding checklists at the time of our observations(Table 1).

Table 1: ICU Characteristics of Units Using Checklists

Variable	Count (%)
Checklist Use	
Yes	12 (37.5)
No	20 (62.5)
Checklist Implementation Time	
<1 year	1 (8.3)
1 year to < 5 years	8 (66.7)
≥ 5 years	3 (25)
Multidisciplinary Rounds	
Yes	31 (96.9)
No	1 (3.1)
Trainees present on rounds	
Yes	22 (68.8)
No	10 (31.2)
Number of Beds	
<10	7 (21.9)
10-20	20 (62.5)
≥20	5 (15.6)
Staffing Model	
Open	21 (65.7)
Closed	10 (31.2)
Mixed	1 (3.1)

4.2 Interviews

In total, 32 ICUs in 14 hospitals participated in this study. We conducted 89 interviews(Table 2) with rounding team members regarding their perceptions of rounding checklists. The average interview time was 11 minutes and 58 seconds. Rounding checklist interview respondent demographics can be found in Table 2. Interviewee respondents were predominantly female(67%) and nurses(55%). Other professions who participated in interviews included: intensivists(12.4%), physicians in training(10%), pharmacists(7.9%), physicians other than intensivists(6.7%), respiratory therapists(3.4%), and others, including social works and care managers(4.5%). Respondents were most commonly in the 18-29 year-old age group(34.5%) and least commonly in the 50+ year-old age group(13.8%).

Table 2: Rounding Checklist Interview Respondents' Demographics

Characteristics	N (%)
Age (years)	
18-29	30 (34.5)
30-39	23 (26.4)
40-49	22 (25.3)
50+	12 (13.8)
Female Gender	60 (67.4)
Profession	
Nurse	49 (55.1)
Intensivist	11 (12.4)
Physician in Training	9 (10)
Pharmacist	7 (7.9)
Physician	6 (6.7)
Other	4 (4.5)
Respiratory Therapist	3 (3.4)

4.3 Emergent Themes

Thematic coding analysis revealed six major themes as well as perceived barriers and facilitators to checklist use in these ICUs. With each theme, we include at least one example of a verbatim quote supporting the associated theme and explain associated barriers and facilitators.

4.3.1 Theme 1: The purpose of rounding checklists is to standardize care

Theme 1 points to the purpose of rounding checklists as perceived by ICU rounding team members. Theme 1 signifies the utility of a rounding checklist in the ICU as a way to standardize patient care. Multiple interviewees stated that the use of a checklist during rounds offered a reminder to avoid errors of omission, allowing for all patients to have a minimal standard of care.

> "So checklists *are tools for reminders; for memory aide* if you will. We're humans and we make mistakes... I can remember 100% of the items that I need to evaluate in one patient, in two patients, but not in 100 patients. So overtime, it's easy to overlook items. And the *objective of the checklist is to standardize medical care by assuring that every single patient have review minimal standards of care.*" (Physician)

Additionally, in Theme 1, interviewees referenced checklist use in aviation, citing that, just like pilots, ICU staff need to be sure they are not missing anything in patient care.

> "This is just a checklist that *exactly like a plane you are flying* to San Francisco from here, that the pilot flew 10,000 miles before but every time, that pilot go through the checklist because they don't wanna miss anything, like us." (Physician)

Interviewees went on to express the perceived benefits of providing standardized care, noting specific items, such as central line insertion days, that are sometimes overlooked in the busy environment of the ICU.

> "…I think the main purpose of checklists is when we're in the ICU there are so many things going on that very often, we can miss out on things like antibiotics or central lines, or easy things, especially when patients are complicated. *And checklists make sure you are complying with everything…*" (Physician)

In this theme, interviewees valued standardization to ensure that each patient would receive a minimum standard of care and noted that checklist use helped with compliance.

4.3.2 Theme 2: The purpose of rounding checklists is to provide a communication tool for rounds

Theme 2 also pointed to the purpose of rounding checklists. Participants indicated that a rounding checklist could be used as a sort of communication tool for rounds and cited that it could be particularly useful for teams which are not familiar with each other's communication styles. Given the interdisciplinary team composition of daily rounds in the ICU, each member has been trained to bring a unique communication style due to their training. The checklist can act as the common denominator between team members, branching across disciplines.

> "I feel they can be useful in making sure that certain areas are touched upon, especially like I mentioned earlier; in a team that's not completely familiar with each other's *communication styles.*" (Nurse)

In checklist implementation, it is important that checklist users understand why a checklist may be useful. As seen below, if a staff member does not perceive the checklist as useful, they are less likely to complete it. If staff is aware of why a checklist is being used in a particular unit, they are more likely to complete it.

> [When asked the purpose of rounding checklists] "…Annoying. I guess I've been doing this for over 30 years and I feel that I have *my own checklist* in my head so when somebody's telling me to do particular checklists, it's just annoying to continually having to refer to something that's *somebody else's idea of what rounding should be.*"(Physician)

For example, the individual above was concerned with his personal checklist, but, as we see below, others acknowledged that using the checklist to facilitate a team approach to rounds could

be beneficial to ensure that each person knew their roll during rounds as well as what to expect from others.

> "I think what would help the most would be a **team understanding of their utility** and to be prepared to talk about what's on the checklist and that would make rounding smoother. So it takes time and persuasion from everybody that this is what we're gonna be talking about and to come forward with that information." (Physician)

If a unit would like to use a checklist as a communication tool for rounds, it is important that the checklist is presented in that light during the development and implementation so that each rounding team member is aware of the proposed purpose of the rounding checklist.

4.3.3 Theme 3: Concern for "Cookie-Cutter" Medicine

The responses in Theme 3 contradicted Theme 1 in that respondents expressed concern for "cookie-cutter" medicine meaning that each patient is unique and clinicians are unable to "fit" each patient into the perceived "cookie-cutter" ways of a standardized checklist.

> "I like them but…you **can't necessarily have a cookie-cutter checklist** for everything unless they're appropriate and about very, very specific things…there might be general things but they need to be **tailored to the patients**." (Nurse)

> "I don't really care much for checklists. They are more in the line of **'cookbook medicine'** which is not how I was trained but that's kind of the way it's going." (Physician)

This "cookbook" or "Cookie-cutter" perception of checklists relates to the content of the checklist and the needs of the patient. In other words, the relevance of the content of the checklists. Relevance was cited as an important barrier or facilitator. If the standardized checklist did not take into account the changing needs of a unit, it would cease to be perceived as a useful tool for rounds.

> "...if the checklist was **not relevant** and it was not changing with the needs of the unit then it would not be helpful. In fact, it would probably be discarded unconsciously very quickly,

if it stopped being relevant. So I think it's important for a checklist to be a live document that changes and adapts to the changing unit."(Physician)

Recognizing checklist item relevance as an important element for checklist development, one interviewee stated that their unit focused their checklist on the needs of that particular unit and staff in terms of shortcomings in general care or protocols.

> "Our checklist actually *focuses on some of the things that we found, or we felt that we were leaving off of our general care***…**The other thing that we did was incorporated some of our department-based protocols into the checklist..." (Physician)

4.3.4 Theme 4: Cognitive use versus Practical use

In Theme 4, interview respondents discussed a disconnect between cognitive awareness of the potential usefulness for checklists and the practical use of checklists in everyday practice. Interviewees often mentioned that they saw data supporting the use of checklists, however, they struggled to implement a checklist in their daily practice.

> "…And I know *we talk all the time about the data,* the literature behind it and the fact that you may be doing it but you may forget something and that's why the checklist is there. And that's why we go through that. *It hasn't been built into our day*." (Physician)

> "*So I would say checklists work. We all know that.* It's just implementing the checklist. So we need to figure out…it's not like physicians who know that it's helpful but we just need to figure out a way that it's easier to incorporate into the rounds." (Physician)

From the quote above, we learned that it is possible to understand the utility of a checklist, in this case from the literature, without understanding how to make time for checklist use during rounds. Below, we see that some interviewees found checklists to be time consuming, adding another element to already busy rounds.

> " And they're *time consuming* too; especially when things get busier." (Physician)

On the other hand, some interviewees, such as the one quoted below, felt that checklists assisted with time management during rounds.

> "Well it **helps with time**. Before we were really using these checklists, rounds could take 2 hours..." (Nurse Unit Director)

There appears to be a gap between understanding the reasons for checklist use and implementing a checklist within a unit. If this gap is bridged effectively, the checklist can be used as a tool to reduce rounding time, however, if the gap is not fully bridged, the checklist may become a hindrance by adding yet another item to daily rounds.

4.3.5 Theme 5: What's in a name?

In Theme 5, the concept of a negative association with the term checklist emerged. Interviewees mentioned that checklists themselves were not bad tools, but the term checklist had a negative connotation.

> "Not saying checklists are bad. I think **it's the terminology**. I think nurses are so used to hearing, 'Ah! Another checklist…another checklist.'" (Nurse)

> "I like tools. I think if you say the word **'tool' instead of 'checklist'**, you'll get more people on board." (Nurse)

In observations, the person running the checklist often encountered negative reactions to the term "checklist", occasionally experiencing audible exhaling, side conversations among rounding team members, and use of cell phones. To counter this perception, individuals would adjust their language accordingly calling the checklist, for example, a "care coordination template". In other units, some referred to a rounding checklist as a rounding guide or tool.

4.3.6 Theme 6: Whose line is it anyways?

In Theme 6, interviewees raised the concept that checklist use is attending dependent. Some interviewees elaborated stating that different attendings have different preferences of or aversions

to checklist use in their unit, citing that if an attending liked the checklist, it was more likely to be used during daily rounds.

> "…***it's very attending dependent***. It's not explicit but different attendings have different tolerance for the checklist. Some like it. Several tolerate it but don't have any particular positive-appearing feelings for it. And some seem somewhat hostile toward it…" (Physician)

Indeed, one barrier to effective checklist use within an ICU was active resistance on the part of physicians to the use of checklists during their rounds.

> "I have ***one physician who absolutely will not use it***. So unless I have somebody on who's willing to sneak around behind him and take the initiative to fill it out, it doesn't get done when that physician is here." (Nurse)

With heavy weight given to attending physicians, their buy-in also emerged as both an important facilitator and barrier during the development, implementation and maintenance of effective checklist use in the ICU. This is exemplified in the quote below which is the response of an interviewee when asked if there were any barriers to checklist use in their unit.

> "Physician ***buy-in. Plain and simple***. Physician buy-in is a big one." (Nurse)

Attending buy-in was also important in different team members' willingness to prompt checklist use if it was forgotten for a patient or day.

> "...And so even ***if the Attending forgets then the practitioner or the nurse will tell him***, 'Oh here's your checklist. You need to fill it out. It's a good thing to do.'" (Nurse)

The individual prompting checklist use may be referred to as a "Checklist Champion". As seen in the quote below, there were sometimes designated persons who took responsibility for making sure the checklist was used consistently.

"…we have *a dedicated nurse who rounds with us and has the checklist and is aware of it*, and has always volunteered to help us complete the checklist when we are very, very short-staffed. And *will kind of remind us* about it; will also bring it back to us if we forget to sign it." (Physician)

Consistent use of the checklist was identified as a facilitator for effective checklist implementation while inconsistent checklist use within a unit was identified as a barrier, and the consistency of use was often associated with attending buy-in.

"I think the challenge is just that there's not a standard way to use it cause again it's *variable based on physician*..." (Pharmacist)

"But *getting everybody to do it reliably* was such a...I guess creating buy-in and maintaining momentum was nearly impossible." (Physician)

Consistent checklist use was mentioned in combination with the presence or absence of checklist use follow-up within the unit. For example, the interviewee below cites directed follow-up as a way to integrate checklist use into daily rounding practices.

"...When we started to use it, I kept track of statistics of how often we actually collected the checklist at the end, 2 or 3 days after they were being done. *We figured out who was using it and who wasn't and then had some directed follow-up.* At this point in the unit, in time, it feels that it's pretty engrained in the way that things flow inside the ICU. " (Physician)

Conversely, some interviewees were unaware of any form of follow-up around checklist use, which does not serve as a good incentive for staff to encourage use.

"[After we're done with the checklist it goes] Probably in a drawer and *forgotten about forever.* I don't know. Not sure" (Nurse)

<center>**4.4 Barriers and Facilitators**</center>

As detailed in section 4.2, common barriers and facilitators to checklist use in the ICU were expressed by interviewee respondents throughout emergent themes.

4.4.1 Perceived Barriers to Checklist Use during Daily Rounds

Barriers to checklist use discussed by interviewees included the following: irrelevant checklist content, general perception that the checklist was not useful, lack of buy-in by rounding team members around the checklist, additional time necessary to complete the checklist, inconsistent use of the checklist by the rounding team, active resistance to checklist use by one or more rounding team members, and lack of follow-up regarding checklist use.

4.4.2 Perceived Facilitators to Checklist Use during Daily Rounds

Facilitators to checklist use discussed by interviewees included the following: relevant checklist content, general knowledge of the utility of the checklist among rounding team members, using the checklist as a time management tool, consistent use of the checklist by the rounding team, presence of a checklist champion (a rounding team member within the ICU who pushed for checklist use), and presence of follow-up regarding checklist use. Follow-up existed in several different forms across the ICUs from required signature on the completed checklist to verbal follow-up by checklist leadership when a rounding team member was not completing the checklist consistently.

4.4.3 Parallel Barriers and Facilitator

As the results were analyzed, it became apparent that the perceived barriers and facilitators mirrored one another and fit in different time points of checklist Development, Implementation and Maintenance. Figure 1 visualizes the various barriers and facilitators and their corresponding

time points in checklist development. Arrows run from Development to buy-in to maintenance to symbolize that buy-in was important throughout all stages of checklist use.
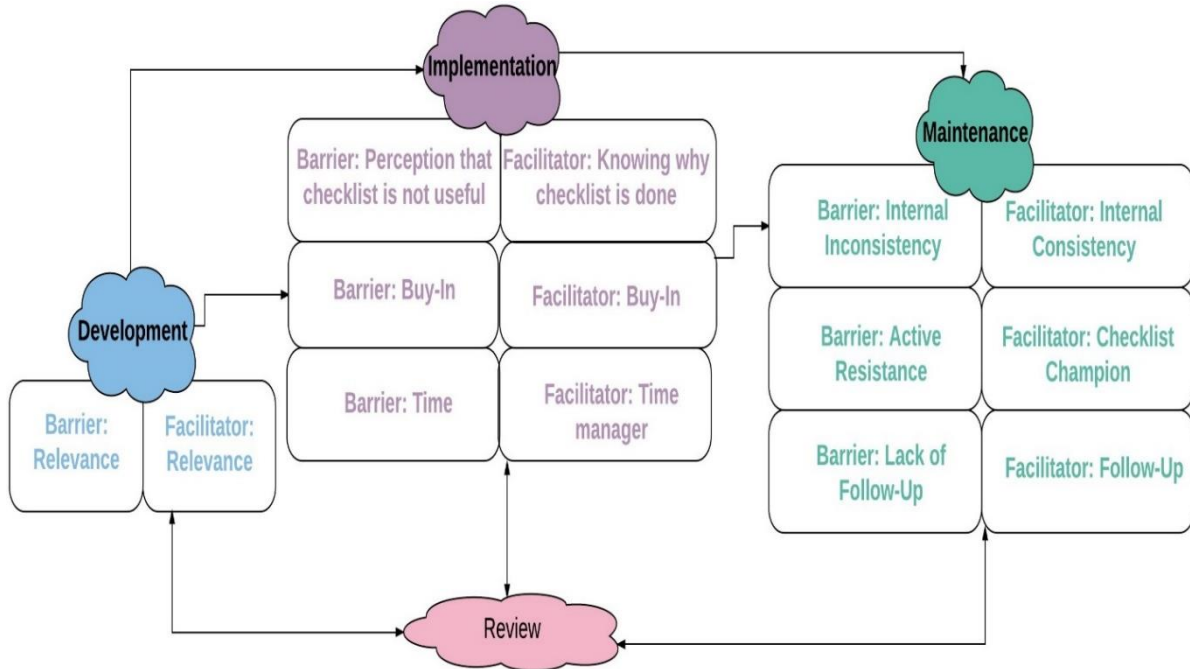
Figure 1. Rounding Checklist Interview Responses Perceived Barriers and Facilitators
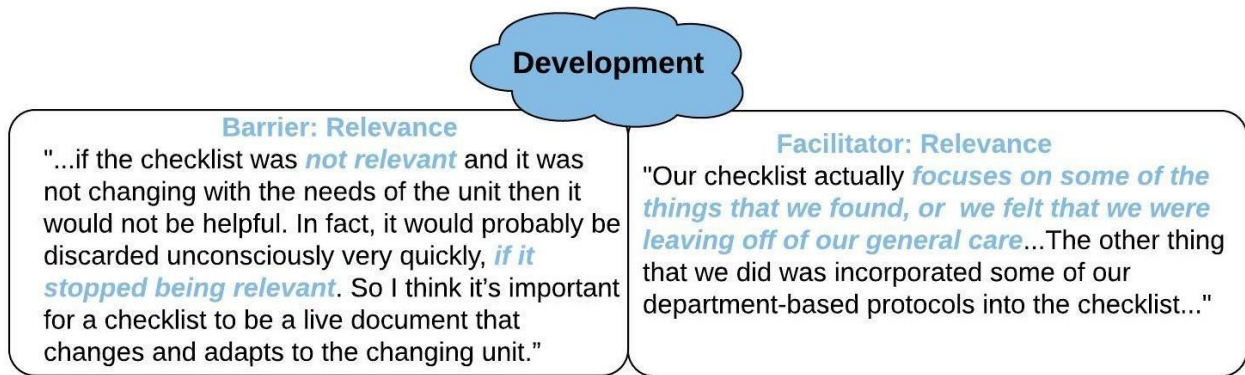
Figure 1a. Rounding Checklist Interview Responses Perceived Barriers and Facilitators to Checklist Development

Implementation

Barrier: Perception that checklist is not useful

[When asked the purpose of rouding checklists] "…Annoying. I guess I've been doing this for over 30 years and I feel that I have *my own checklist* in my head so when somebody's telling me to do particular checklists, it's just annoying to continually having to refer to something that's somebody else's idea of what rounding should be."

Facilitator: Knowing why checklist is done

"I think what would help the most would be a *team understanding of their utility* and to be prepared to talk about what's on the checklis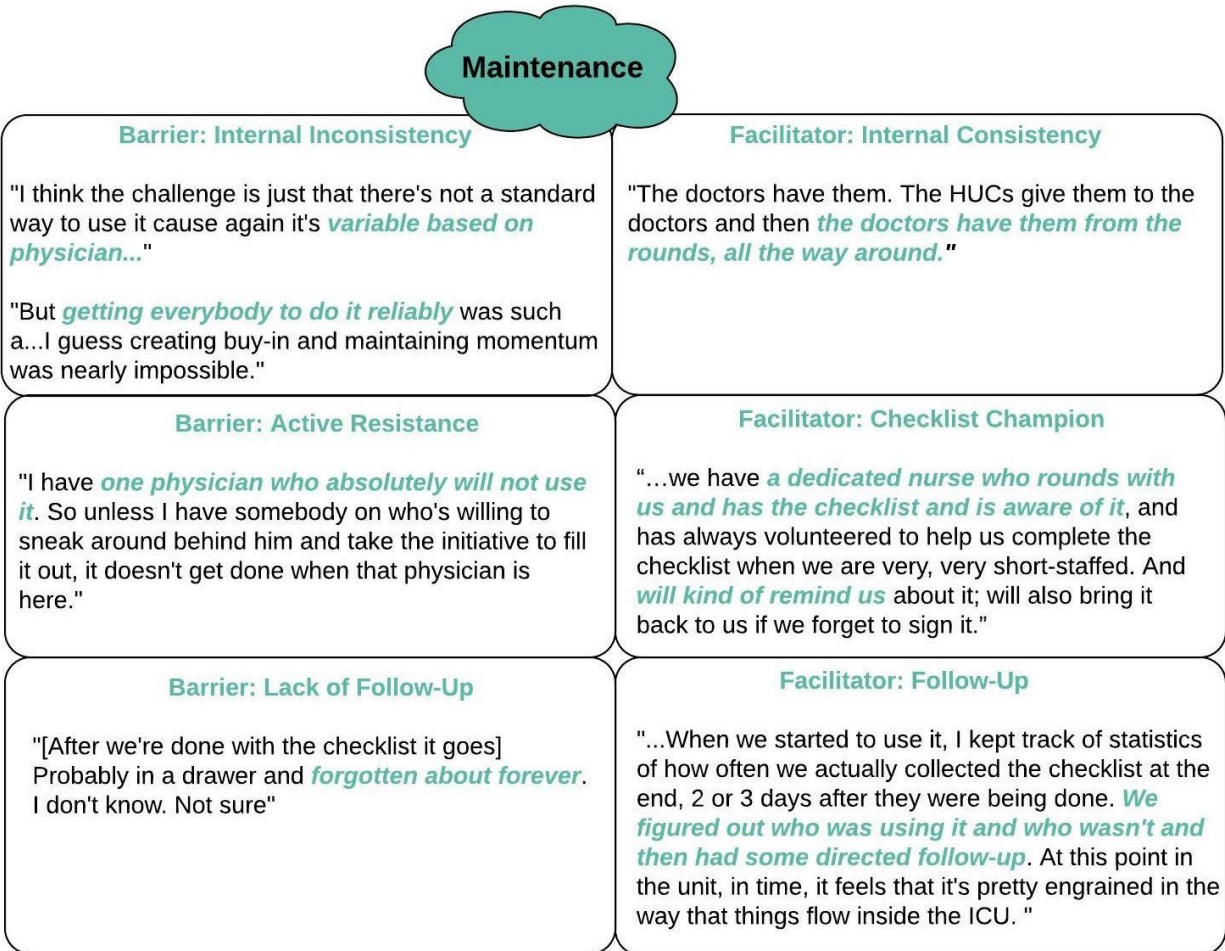t and that would make rounding smoother. So it takes time and persuasion from everybody that this is what we're gonna be talking about and to come forward with that information."

Barrier: Buy-In

"Physician *buy-in. Plain and simple*. Physician buy-in is a big one."

Facilitator: Buy-In

"...And so even *if the Attending forgets then the practitioner or the nurse will tell him*, 'Oh here's your checklist. You need to fill it out. It's a good thing to do.'"

Barrier: Time

" And they're *time consuming* too; especially when things get busier."

"I don't know if it's a barrier really, but if anything it would be the *time involved to do it*."

Facilitator: Time manager

"Well it *helps with time*. Before we were really using these checklists, rounds could take 2 hours..."

Figure 1b. Rounding Checklist Interview Responses Perceived Barriers and Facilitators to Checklist Implementation

Maintenance

Barrier: Internal Inconsistency

"I think the challenge is just that there's not a standard way to use it cause again it's *variable based on physician...*"

"But *getting everybody to do it reliably* was such a...I guess creating buy-in and maintaining momentum was nearly impossible."

Facilitator: Internal Consistency

"The doctors have them. The HUCs give them to the doctors and then *the doctors have them from the rounds, all the way around.*"

Barrier: Active Resistance

"I have *one physician who absolutely will not use it*. So unless I have somebody on who's willing to sneak around behind him and take the initiative to fill it out, it doesn't get done when that physician is here."

Facilitator: Checklist Champion

"…we have *a dedicated nurse who rounds with us and has the checklist and is aware of it*, and has always volunteered to help us complete the checklist when we are very, very short-staffed. And *will kind of remind us* about it; will also bring it back to us if we forget to sign it."

Barrier: Lack of Follow-Up

"[After we're done with the checklist it goes] Probably in a drawer and *forgotten about forever*. I don't know. Not sure"

Facilitator: Follow-Up

"...When we started to use it, I kept track of statistics of how often we actually collected the checklist at the end, 2 or 3 days after they were being done. *We figured out who was using it and who wasn't and then had some directed follow-up*. At this point in the unit, in time, it feels that it's pretty engrained in the way that things flow inside the ICU. "

Figure 1c. Rounding Checklist Interview Responses Perceived Barriers and Facilitators to Checklist Maintenance

5. Discussion

Our results highlight the general perceptions of ICU rounding team members regarding rounding checklists within UPMC ICUs. Overall, interviewees reported that checklists have the potential to be used as standardization and communication tools within the ICU. However, other interviewees noted negative connotations with checklists including the thought that checklists support the idea of "cookie-cutter" or "cookbook" medicine, noting that patients are individuals and do not necessarily fit into preconceived checklists. Other negative connotations were mentioned in regards to the nomenclature of checklists and interviewees recommended changing the terminology from "checklist" to "tool". Finally, interviewees discussed that though ICU staff may think a checklist is a good idea in theory, it is difficult to integrate a new tool into daily practice. Overall use of checklists was said to be highly dependent on the approval of checklist use by attending physicians. Throughout these themes, several barriers and facilitators to effective checklist use were also identified. The barriers and facilitators, including checklist item relevance, perceptions that the checklist is not useful versus knowing why the checklist is done, achieving and maintaining buy-in, the checklist taking up additional time or acting as a time manager, internal consistency or inconsistency, active resistance to checklist use or the presence of a checklist champion, and follow-up or lack of follow-up on checklist use, exist in different stages of checklist Development, Implementation and Maintenance.

In previous studies, checklist use was not associated with reduction in in-hospital mortality[8]. Other studies highlighted issues surrounding checklist compliance[6, 7, 16]. Further still, another study found success in improving multiple processes of care with the use of physician prompting for checklist use, however, no improvement was seen with checklist use alone without prompting[4]. Given our findings, it is likely that researchers could have benefited from taking a

step back to look at the content of the checklist against the needs and culture of the study units. For example, Cavalcanti et al.[8] randomly assigned a standardized checklist versus no checklist use within 118 ICUs. Our findings argue against the use of a single standardized checklist used in many different ICUs. Additionally, given the random application of the standard checklist, it is unlikely that Cavalcanti et al.[8] took the time to develop buy-in and share knowledge on utility of checklists with study units. A more effective approach would be to customize the checklist for each ICU, change the checklist as needs evolve over time, and work to ensure buy-in from all providers prior to and during implementation.

Our study provides insight into why checklists have not consistently led to improved patient outcomes. By investigating perceptions of rounding checklists in UPMC ICUs, we have developed an understanding of common themes and barriers and facilitators to effective checklist use. These barriers and facilitators are not unique to checklist use. In fact, the literature cites physician attitudes, which are likely related to inconsistency of use and active resistance; lack of adequate staffing, which could be related to presence of a checklist champion, lack of follow-up on checklist use, and inconsistent checklist use; and acceptable practices, which are likely tied to obtaining and maintaining buy-in, as common barriers to Quality Improvement tools as whole.

5.1 Framework for Effective Checklist Implementation

Through this understanding, we have developed a suggested framework for effective checklist implementation through greater feedback and accountability. In a previous study[8], a standardized checklist was applied randomly across different participating ICUs, and there was no significant reduction in in-hospital mortality. The findings from our study illustrate the need to make ICU rounding checklists relevant and customizable to a particular unit. By fine-tuning checklists for

relevance to a particular patient population as well as staff needs, a larger impact on patient outcome through targeted intervention and more committed use by staff may be possible. Along those lines, our findings illustrate the need to recognize the importance of achieving buy-in across stakeholders throughout the checklist development, implementation, maintenance, and periodic review. This buy-in will help to achieve another essential component to effective checklist use which is ensuring consistent checklist use over time.

If a unit or unit director is interested in implementing a rounding checklist, it is important to recognize milestones during checklist development, implementation and maintenance and to understand the need for constant review. First, a unit director should survey staff to assess baseline buy-in to the idea of a rounding checklist. If there is interest in potential development of a checklist, staff should look into current practices to understand relevant and meaningful items to place on the rounding checklist. Items on the checklist should be easily integrated into daily rounds, and the checklist should not take a significant amount of time to complete. Checklist content should be reviewed and approved by interdisciplinary rounding team members. Each rounding team member should be informed on the potential utility of a checklist in their unit including expectations for use in that particular unit. For example, if it is the expectation of the checklist creators that the checklist will be completed verbally, that should be known across care providers in the unit. Checklist use should be followed-up consistently even after the implementation period and assessments of checklist impact, such as before-after process of care outcomes, in the unit should be completed if possible. Identification of a Checklist Champion, an individual who actively encourages checklist use during rounds, is vital to the maintenance and continued use of the checklist. Periodic review of checklist use, content, and buy-in should continue for the entire

time the checklist is intended to be used. Checklist content and use should be altered according to findings from periodic review processes.

5.2 Strengths and Limitations

This project has several strengths. To our knowledge, this is the first study of its kind to systematically explore barriers to checklist use in ICUs. We were able to examine in-depth the provider perceptions of checklists in this population. These findings can likely be transferred to other fields in medicine for effective checklist implementation. This study included various types of ICUs such as medical, medical surgical, trauma, critical care, neurological and cardiac in addition to open and closed models, and bed sizes ranging from less than ten to greater than 20 which makes it representative of various ICU environments. We interviewed predominantly nurses, who have the opportunity to work closely with patients to understand their most up to date needs while working with a variety of different physicians.

This project was not without limitations. The generalizability of this study is limited as the majority of interviews were conducted with nurses. The input from these nurses was likely representative of working with a range of physicians, however, this could also have limitations given the nurses' expectations of rounds are likely different from the other professions. Additionally, a majority of units with checklists had implemented their checklist within one to five years ago, which means that may have different barriers than those units without a checklist or those who are just beginning checklist development. There is potential for bias on the part of researchers as well as interviewee respondents and rounding team members. While research bias is unlikely due to the way in which four trained investigators concurrently coded the data, resolving any differences through iterative discussion and consensus, it is possible that some forms of

response bias remain. We attempted to minimize interviewer bias through the use of the interview guide and training. Finally, inclusive bias is possible due to the convenience sampling of interviewees following rounds. With these strengths and limitations in mind, we understand that the results of this study are not generalizable across all ICUs.

5.3 Conclusions

The results of this study are a solid starting point for effective adoption of rounding checklists in UPMC ICUs. Effective adoption of rounding checklists in UPMC ICUs would require addressing concerns about their perceived usefulness and time commitment. If a unit chose to implement checklists, obtaining buy-in from attending physicians would be an integral part of the sustainability plan of checklist use. Finally, physicians and other stakeholders should be included in the developmental and promotional process. If UPMC ICUs choose to develop checklists in this manner, they should carry out before-after studies regarding patient outcomes prior to and following new checklist implementation to determine the effectiveness of their checklist. This should be repeated periodically to review the checklist content and use as it relates to the unit at different points in time.

If the approach to checklist development, implementation, and maintenance is adopted in terms of the particular needs of each intensive care unit, the potential for public health impact is far-reaching. Checklists act as a reminder to complete tasks and follow up to date evidence based practice which could result in reduction of costs and loss of life thus having major public health significance.

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