Title

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Call me Ishmael: addressing the white whale of team communication in the operating room with labelled surgical caps at an academic medical centre

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ABSTRACT

Introduction Effective communication in the operating room (OR) is crucial. Addressing a colleague by their name is respectful, humanising, entrusting and associated with improved clinical outcomes. We aimed to enhance team communication in the perioperative environment by offering personalised surgical caps labelled with name and provider role to all OR team members at a large academic medical centre.

Materials and methods This was a quasi-experimental, uncontrolled, before-and-after quality improvement study. A survey regarding perceptions of team communication, knowledge of names and roles, communication barriers, and culture was administered before and after cap delivery. Survey results were measured on a 5-point Likert Scale; descriptive statistics and mean scores were compared. All cause National Surgical Quality Improvement Project (NSQIP) morbidity and mortality outcomes for surgical specialties were examined.

Results 1420 caps were delivered across the institution. Mean survey scores increased for knowing the names and roles of providers around the OR, feeling that people know my name and feeling comfortable communicating without barriers across disciplines. The mean score for team communication around the OR is excellent was unchanged. The highest score both before and after was knowing the name of an interdisciplinary team member is important for patient care. A total of 383 and 212 providers participated in the study before and after cap delivery, respectively. Participants agreed or strongly agreed that labelled surgical caps made it easier to talk to colleagues (64.9%) while improving communication (66.0%), team culture (60.5%) and patient care (56.8%). No significant differences were noted in NSQIP outcomes.

Conclusions Personalised labelled surgical caps are a simple, inexpensive tool that demonstrates promise in improving perioperative team communication. Creating highly reliable surgical teams with optimal communication channels requires a multifaceted approach with engaged leadership, empowered front-line providers and an institutional commitment to continuous process improvement.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Communication gaps in the operating room (OR) can lead to errors and adverse surgical events.
⇒ Pilot studies have shown positive effects on staff experience with surgical caps labelled with name and role.

WHAT THIS STUDY ADDS

⇒ Prior studies were limited in size and scope.
⇒ The current study describes an institution-wide implementation of labelled surgical caps and the impact they can have in team communication in the perioperative environment at a large, multisite academic medical centre.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE, OR POLICY

⇒ Labelled surgical caps are a simple, inexpensive tool that demonstrates promise in improving perioperative team communication which can be easily replicated in health systems across the USA.

INTRODUCTION

Effective communication between multidisciplinary teams in the operating room (OR) is crucial for timely problem solving and high-quality patient care.[1–6] In a recent Joint Commission report, communication errors were the leading cause of patient safety events in the OR, accounting for 64% of events that resulted in death, permanent harm or severe temporary harm.[2] The majority of these errors occur between interdisciplinary team members from fields including but not limited to surgery, anaesthesiology, nursing, technicians, radiology and pathology.

Collegiality and familiarity are important aspects of fostering highly reliable surgical teams. The WHO Guidelines for Safe Surgery strongly emphasise the importance of performing team member introductions.[4] Using the names of colleagues in a

clinical setting can improve team interactions through name-specific closed-loop communication. Addressing a colleague by their name is respectful, humanising, entrusting and associated with improved clinical outcomes.[7] Unfortunately, many surgical team members often do not know the names of people they are working with.[8 9] Even with proper introductions at the beginning of a case, remembering names is challenging. Humans only recall 30% of names after first introduction,[10] a problem exacerbated in large health systems with rotating staff members.

In an effort to improve the utilisation and recall of names in the OR, several groups have provided OR team members with labelled surgical caps that display their name and role on their head for easy visibility. Douglas *et al*[11] and Brodzinsky *et al*[12] conducted pilot studies using labelled surgical caps in a general hospital in Australia, and during caesarean sections at a US academic medical centre, respectively. Both pilot trials showed promise in improving team communication and perceived teamwork and thus warrant further investigation.

This article describes a quality improvement project aiming to enhance team communication and morale by offering personalised surgical caps labelled with name and role to perioperative team members including providers and staff. We describe the experience at a large academic medical centre including the benefits, limitations and lessons learnt from the project.

MATERIALS AND METHODS

Ethical statements

The protocol for this project was reviewed by the University of California San Diego Institutional Review Board who determined the study to be exempt from patient consent. This was a quasi-experimental, uncontrolled, before-and-after quality improvement study.[13 14] Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research. This article adheres to the applicable Standards for Quality Improvement Reporting Excellence 2.0 guidelines.

Setting

The study institution is a large quaternary academic centre with two main hospitals containing 33 ORs, two general ambulatory surgery centres, a comprehensive eye surgical centre, and inpatient and outpatient procedure suites, all of which will be referred to as ORs. More than 24 000 inpatient and 58 000 outpatient operations and procedures are conducted within the ORs annually. Many providers continually rotate through the ORs across the medical campuses, including residents and fellows. The nursing staff and technicians are primarily dedicated to one of the abovementioned facilities, whereas the surgical and anaesthesia faculty may work in multiple areas. Among certain specialties such as transplant or cardiothoracic surgery, the surgical teams are generally staffed by the same personnel during business hours as well as with dedicated call teams. However, due to the size and volume of our institution, in many instances surgical teams are working with a variety of staff and providers who may not be familiar with one another.

The 'What's Your Name' initiative

As part of an initiative to improve interdisciplinary team communication, personalised embroidered surgical caps or bouffants labelled with preferred name, degree, and department or position were offered to all team members within perioperative services. The surgical caps were available to any employee or student at the study institution who helped provide surgical care to our patients, including but not limited to surgery and anaesthesia teams (attendings, residents, fellows and advanced practitioners), nursing staff, technicians, environmental services, schedulers, central and sterile processing, pathology, radiology, other ancillary services, as well as non-clinical team members (management, analysts, administration). The two surgical cap styles shown in figure 1 were designed with and purchased from a local third-party vendor (Precision Threads Embroidery, Chula Vista, California, USA). To obtain a personalised surgical cap, a perioperative team member would complete a brief online order submission form with their preferred

Figure 1 Example picture of labelled surgical cap (left) and bouffant (right).

full name and stated specific role or department. Examples of roles included anaesthesia, surgical department, surgical tech, circulator, preop nurse, neurosurgery resident, and so on. The caps were advertised by distributing posters throughout the ORs, email memorandums to the perioperative services list-serve, and announcements at local surgical and quality improvement forums.[10]

On 25 June 2021, the first shipment of surgical caps was delivered across the study institution's perioperative campuses. A final opportunity to order a cap was offered on the day of initial cap delivery and a second round of cap delivery occurred 2 months later. Team members were encouraged to wear the personalised caps; however, use was non-mandatory. The idea was promoted to managers and division leads at local quality and patient safety forums, an educational packet was distributed individually at the time of cap delivery, and use was further promoted at daily engagement huddles during the project period. Disposable caps or individually owned reusable caps were also permitted at a team member's own discretion. Team members were instructed to focus on using each other's names while caring for patients and to ensure caps were recently laundered. There were no changes made to standard patient care or OR procedures during this project. Of note, each procedure is preceded by a standardised surgical time out, during which it is protocol to begin with team member introductions per WHO guidelines.[4] This practice was also not altered during this project. Funding for the caps was internal.

Survey

An anonymous electronic survey regarding experiences of culture and communication was administered to perioperative team members before and after delivery of surgical caps. The first survey was administered 3 months prior to cap delivery and was open for a 3-month period. It was available as an optional link at the end of the order submission form, sent as an email, and posted around the ORs. The second survey was administered 6 months following cap delivery and was available over a 3-month period. It was also sent as an email and posted around the ORs. Of note, the surgical caps were able to be ordered in bulk for whole departments. Thus, we cannot confirm that every participant who ordered a cap was administered the option to complete a survey. The survey questions were developed and expanded on from those used by Brodzinsky *et al*'s pilot study of labelled caps in the OR during caesarean sections.[12] Participants were surveyed on their general experiences of culture and communication around the ORs and of their knowledge and use of names and roles of other perioperative team members. After the intervention, participants were additionally surveyed on the specific impact the surgical caps had on remembering names, team communication, culture and patient care. The surveys are available for reference in the online supplemental material. Demographic data were anonymously obtained from study participants. Survey questions were answered on a 5-point Likert Scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree).[15] Descriptive statistical analysis was performed using Microsoft Excel. Given the anonymous nature of the survey, direct before and after implementation data pairings were not able to be made and these data samples cannot be considered independent. Therefore, parametrical statistical analysis was not appropriate. To compare Likert items before and after the intervention, a value between 1 and 5 was given to each response as outlined above and mean values were obtained. Subgroup analyses were performed for the surgery, anaesthesia and circulator nurse/surgical tech roles. Further subgroup analyses were performed for demographic variables including gender, race/ethnicity, age and years worked at the study institution. Additional survey responses to questions asked only after the intervention are separately described. Likert items were compared for those who agreed or strongly agreed with those who disagreed or strongly disagreed.

Additionally, American College of Surgeons National Surgical Quality Improvement Project (NSQIP) morbidity and mortality rates for all surgical specialties at the study institution were examined for the project implementation time period. Hypothesis testing (z-test) was used for comparison between rates before and after labelled surgical cap delivery. A value of $p<0.05$ is considered statistically significant.

RESULTS

1420 personalised surgical caps and bouffants were delivered to perioperative team members during the project period. Table 1 demonstrates the breakdown of the perioperative services team members who received caps by their role in the perioperative services department. The largest groups to receive caps were OR Nurse Circulator/Surgical Tech (n=410, 30%), Surgery team (n=368, 27%) and Anaesthesia team (n=120, 9%). At the time of cap delivery there were 275 surgeons, 170 surgical residents, 104 anaesthesiologists, 44 anaesthesia residents, 68 certified registered nurse anaesthetists, 184 OR circulating nurses and 109 surgical technicians who worked as permanent faculty or staff for the study institution.

383 perioperative team members completed the survey before the intervention, and 212 completed the survey after the intervention. Assuming that each of the 1420 were delivered to unique individuals and that these individuals represent the denominator for survey completion, our survey response rates would be 26.97% and 14.92% before and after the intervention, respectively. Demographic information of the survey participants is shown in table 2. The proportion of male and of Asian, non-Hispanic survey participants decreased after the intervention. There were no other statistically significant differences between the two groups. The mean number of years worked at the study institution was 7.59 years in the survey before the intervention and 9.42 years in the survey after the intervention.

Table 1 Perioperative role of team members who received labelled surgical caps

Provider role	Number of orders (%)
OR[1] Nurse Circulator/Surgical Tech	410 (29%)
Surgery	368 (26%)
Anaesthesia	120 (8%)
Preoperative/PACU[2] nurse	108 (8%)
Radiology	102 (7%)
Interventional radiology	57 (4%)
Other clinical support staff	50 (4%)
Unknown	45 (3%)
Management/administration	42 (3%)
Non-clinical role	34 (2%)
Anaesthesia technician	25 (2%)
Gastroenterology	23 (2%)
Interventional pain	13 (1%)
Student	12 (1%)
Interventional pulmonology	9 (1%)
Interventional cardiology	2 (<1%)
Total	1420

OR, operating room; PACU, postanaesthesia care unit.

A comparison of mean scores on each Likert item is shown in figure 2. Mean scores increased with regard knowing the names and roles of everyone around the OR, feeling that colleagues know 'my name', the importance of knowing the names of colleagues, and feeling comfortable communicating directly and without barriers with surgeons, anaesthesiologists, nurses and technicians. The mean score for 'team communication around the ORs is excellent' was essentially unchanged (3.38 vs 3.37). The mean score decreased for 'team culture around the OR is excellent (3.08 vs 3.43)'. The highest scores (before=4.40, after=4.45) were recorded for 'knowing the name of an interdisciplinary team member is important for patient care'.

Subgroup analyses comparing the survey scores of surgical team members to anaesthesia team members and OR staff team members are shown in figure 2. When comparing name usage in the OR before and after the intervention, all roles reported positive trends postintervention. However, the surgical team demonstrated the largest increase when reporting that 'I know the names of everyone around the OR', while the anaesthesia team demonstrated the smallest increase for that question. On the other hand, the anaesthesia team demonstrated the largest increase when reporting that 'My colleagues know my name', and the surgery team demonstrated the smallest increase for that question. While the aggregated score with regard to team communication in the OR was net neutral (3.38 vs 3.37), the OR staff subgroup score decreased (3.02 vs 3.18) and the surgery and anaesthesia subgroup scores increased (3.96 vs 3.65 and 3.17 vs 3.02, respectively). With regard to team culture in the OR, all subgroups scores decreased. Survey answers did not differ substantially within other demographic subgroup analyses.

Individual and mean scores for additional survey questions asked only after the intervention are shown in table 3. The majority of survey respondents agreed that labelled surgical caps improved communication in the OR (66% agree, 8.6% disagree; mean score=3.90/5), team culture (60.6% agree, 11.4% disagree; mean score=3.77/5) and ultimately patient care (56.7% agree, 11.4% disagree; mean score=3.74/5). The highest scoring question indicated that study participants would like the study institution to continue providing named surgical caps to perioperative team members (72.1% agree, 4.9% disagree; mean score=4.16/5).

There were no statistically significant differences before compared with after the delivery of labelled scrub caps for the following NSQIP variables: unplanned return to OR (2.53% vs 1.83%, p=0.21), sepsis (1.02% vs 0.93%, p=0.56), surgical site infection (3.57% vs 3.12%, p=0.21), venous thromboembolism (0.84% vs 0.85%, p=0.72), ventilator >48 hours (0.56% vs 0.57%, p=0.72) and mortality (0.71% vs 0.85%, p=0.45) (online supplemental figure 1).

DISCUSSION

We delivered more than 1400 personally labelled surgical caps to providers and staff across the perioperative environment. We found the caps positively impacted experiences with team communication. The majority of survey participants reported the caps improved name recall, reduced communication barriers and facilitated conversation between interdisciplinary colleagues. These results expand on prior literature done in a single department[12] or single hospital site.[11 16] A comparison of survey results before and after the intervention suggests the degree of this effect was modest when measured at the scale of a large university-based hospital. Offering complimentary surgical caps alone may not be sufficient to demonstrate a pronounced improvement in clinical outcomes. Nonetheless, the intervention is simple, has no apparent major negative consequences and demonstrated clear benefit in enhancing perioperative team communication.

'Knowing the name of an interdisciplinary team member is important for patient care' had the highest mean survey score both before and after implementation (mean 4.45/5.0). This finding demonstrates the value people place on knowing each other's names. Speaking to providers by their preferred name is enabling and improves response time to directed communication.[7 8 17] Contrarily, it can be disruptive and embarrassing to ask a colleague's name or demoralising to receive nameless, shouted instructions. Labelled caps are an intuitive mechanism of enabling personal identification by placing names in the direct line of sight.

Table 2 Demographics of labelled surgical caps survey participants

Survey participant demographics			
	Before intervention n=383 (%)	After intervention n=212 (%)	P value
Gender			
Female	205 (53%)	123 (58%)	0.28
Male	161 (42%)	71 (33%)	**0.04**
Non-binary/third gender	0 (0%)	1 (0.5%)	0.17
Prefer not to answer	17 (4%)	17 (8%)	0.07
Race/ethnicity			
Hispanic	48 (13%)	27 (13%)	0.58
Asian, non-Hispanic	117 (31%)	37 (17%)	**0.0005**
White, non-Hispanic	141 (37%)	98 (46%)	**0.03**
Black or African-American	13 (3%)	3 (1%)	0.15
Non-native American or American Indian	2 (1%)	1 (0.5%)	0.08
Other	9 (2%)	5 (2%)	0.99
More than one race	15 (4%)	15 (4%)	0.09
Prefer not to answer	38 (10%)	32 (15%)	0.06
Role in operating room			
Surgery team	116 (30%)	52 (25%)	0.14
Anaesthesia team	57 (15%)	38 (18%)	0.33
Anaesthesia tech	4 (1%)	1 (0.5%)	0.47
Management	8 (2%)	13 (6%)	0.99
Non-clinical role	18 (5%)	11 (5%)	0.79
Surgical Tech	18 (5%	13 (6%)	0.45
Preoperative/PACU	53 (14%)	20 (9%)	0.17
Nurse Circulator	45 (12%)	37 (17%)	0.06
Other clinical support staff	50 (13%)	27 (13%)	0.91
Student	6 (2%)	0 (0%)	0.07
Provider role			
Attending physician	82 (21%)	51 (24%)	0.45
Advanced practitioner	19 (5%)	10 (5%)	0.89
Fellow	10 (3%)	4 (2%)	0.57
Resident	47 (12%)	18 (8%)	0.16
Other	11 (3%)	4 (2%)	0.47

PACU, postanaesthesia care unit.

Interestingly, following the surgical cap intervention, surgeons felt more confident in knowing other team members' names while anaesthesiologists felt more confident that other team members knew their names (figure 2A). As cases are scheduled under the surgeon while anaesthesia providers may alternate throughout the day, the name of the surgeon is more often known in advance. With the use of labelled caps, surgeons appreciated being able to look across the drape and quickly identify who to communicate with. Further research is necessary to determine if labelled caps can decrease the incidence of shouting *'Hey Anesthesia'*, across the drape.

It was noted in our subgroup analyses that participants who identified as male tended to answer some of the questions on average more favourably compared with those who identified as female. And participants who identified as working at the study institution for less than 2 years answered some of the questions with larger changes in a positive direction between the preintervention and postintervention surveys compared with those who identified as working at the study institution longer. This may demonstrate an effect of the caps making it easier to communicate and learn or help reinforce the names of colleagues in the OR particularly for those who

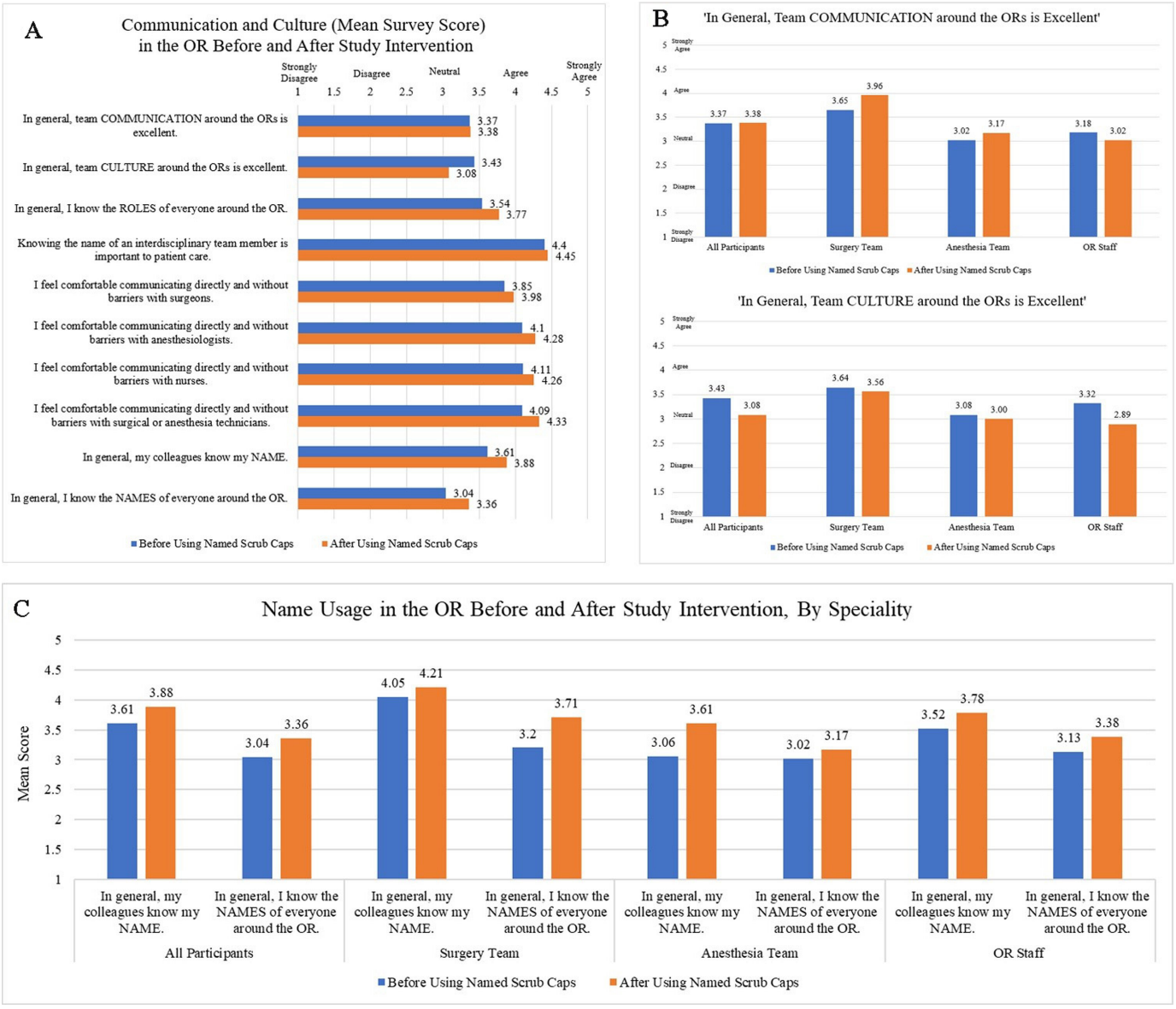

Figure 2 (A) Mean survey scores before (blue) and after study (orange) intervention. (B, C) Mean before and after survey scores, subgroup analyses broken down by provider role. (Five-point Likert Scale with 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). OR, operating room.

are newer and may not be as familiar with as many of their colleagues' names yet.

We acknowledge that labelled surgical caps are not a panacea for ensuring perfect communication. Indeed, some of our survey results had a negative trend. In reviewing the subgroup analysis, the team communication mean score decreased among the OR staff subgroup despite increasing among surgeons and anaesthesiologists (figure 2B). Circulating nurses are often physically distanced from the rest of the team and out of the direct field of view, theoretically making it more difficult to visualise a labelled cap. However, there is no clear explanation for these trends. The only negative overall result was the trend of perceived culture around the ORs (figure 2C). The study period crossed several outbreaks of COVID-19 that presented challenges with staff turnover. Specifically, the Omicron outbreak in the winter of 2021 caused one of the study institution's largest COVID-related admission surges (online supplemental figure 2). A component of provider burn-out, which increased during the pandemic,[18 19] could have contributed to this negative result. As expected, the examined NSQIP outcomes did not statistically significantly change. While labelled caps certainly have the potential to improve communication and reduce adverse events, it is hard to draw specific conclusions or correlations between implementation of the labelled surgical cap intervention and surgical outcomes. Creating highly reliable surgical teams with optimal communication channels requires a multifaceted approach with engaged leadership, empowered front-line providers, and an institutional commitment to continuous process improvement.[20]

Importantly, only a single surgical cap was provided to participants during the initial study period, a minority of

Table 3 Survey ratings after intervention on experienced impact of surgical caps (5-point Likert Scale with 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)

After intervention survey questions	Agree or strongly agree (n)	Neutral (n)	Disagree or strongly disagree (n)
Named surgical caps improved **communication** in the operating room	66.0% (122)	25.4% (47)	8.7% (16)
Named surgical caps make it **easier to talk** to interdisciplinary colleagues	64.9% (120)	25.4% (47)	9.7 % (18)
Named surgical caps help to **remove communication barriers**	61.6% (114)	24.3% (45)	14.1% (26)
Named surgical caps help to **remember** who I am working with	75.7% (140)	15.7%. (29)	8.6% (16)
Named surgical caps **improve patient care**	56.8% (105)	31.9% (59)	11.4% (21)
Named surgical caps **improve team culture**	60.5% (112)	28.1% (52)	11.4% (21)
Named surgical caps improve **communication** directly and without barriers **with surgeons**	59.5%. (110)	25.9% (48)	14.6% (27)
Named surgical caps improve **communication** directly and without barriers **with anaesthesiologists**	64.3%. (119)	21.1% (39)	14.6% (27)
Named surgical caps improve **communication** directly and without barriers **with nurses**	68.1%. (126)	20.5% (38)	11.4% (21)
Named surgical caps improve communication with **surgical or anaesthesia technician**s	68.6 % (127)	19.5% (36)	11.9% (22)
I would like UCSD to **continue providing** named surgical caps	72.1% (165)	22.9%. (42)	4.9%. (7)

UCSD, University of California, San Diego.

providers did not order a cap and use was non-mandatory. Though there is no difference in infection risk between fabric and disposable surgical caps,[21–27] reusable caps require laundering, making it difficult to wear a single cap every day. Thus, we found that while caps were abundant around the ORs, it was rare to observe entire teams wearing the caps simultaneously, potentially limiting their impact. Brodzinksy *et al* evaluated 10 caesarean sections in which every team member was given a labelled cap.[12] Many providers enjoy the freedom of expression in wearing their own unique surgical caps. Our approach was to offer a cap in a fashion that is realistic of what could be replicable at other institutions—namely, at least one, non-mandatory, complementary cap. Providing two or three caps to each team member would make it easier to maintain a laundered and available cap. Funding may be a barrier. However, if labelled surgical caps prevented even a single adverse event, they would be financially solvent. Surgery-related adverse events can increase the cost to the institution of a single index hospitalisation by more than $50 000[28]—an estimate that does not include the potential for litigation.

A major limitation to the current study is relatively low response rates to the surveys. However, given the large total volume of survey participants (n=383 before and n=212 after cap delivery) with robust representation from each discipline, we feel as though an adequate sampling of our providers and staff was obtained to draw conclusions on the impact of caps. Additional limitations to the current study include the inability to perform statistical analysis and reliance on descriptive data, lack of qualitative data in the survey, and lack of direct objective observable data on the impact of this intervention on communication. It is also possible, though unlikely, that individuals who completed either the before or after survey did not order or wear their own cap, therefore potentially confounding our findings. Further research is needed to objectively measure communication instances between team members, assess the long-term impact of this intervention on patient outcomes, and to determine the best methods for implementation in different clinical settings. Additionally, research is needed to determine the impact of labelled surgical caps on other aspects of OR communication and patient safety, such as handover communication and team coordination.

Over the past two decades, numerous initiatives aimed towards improving interdisciplinary communications and preventing communication breakdown in the perioperative setting have become popularised across hospitals in the USA and globally. These include the Joint Commission Universal Protocol,[3] the WHO Surgical Safety Checklist (online supplemental file 5),[4] preprocedural briefings and huddles, intraoperative check-ins, as well as clear and respectful communication guidelines for all perioperative team members. Despite major advancements in patient safety, more than 5000 surgical never events are estimated to occur annually in the USA,[5] highlighting the need for continual process improvement. Based on our experience and building on others, personalised surgical caps are a cost-effective patient safety intervention to add to the toolkit.

CONCLUSIONS

The results of this quality improvement project highlight the importance of clear identification and communication in the OR and provide support for the adoption of labelled surgical caps in the perioperative environment. Personalised surgical caps are an inexpensive intervention that demonstrate promise in improving perioperative

team communication at an academic medical centre. We hope this article can help other institutions adopt this simple method of promoting teamwork. Creating highly reliable surgical teams with optimal communication channels requires a multifaceted approach with engaged leadership, empowered front-line providers and an institutional commitment to continuous process improvement.[20]

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Contributors NHG contributed to the study design, data gathering, analysis and writing of the manuscript. SM contributed to the data analysis and writing/editing of the manuscript. CAL, EM, MJ and KM contributed to the study design and editing of the manuscript. BC, RS, MM and LR contributed to the editing of the manuscript. JJR contributed to the study design, data gathering and editing of the manuscript.

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